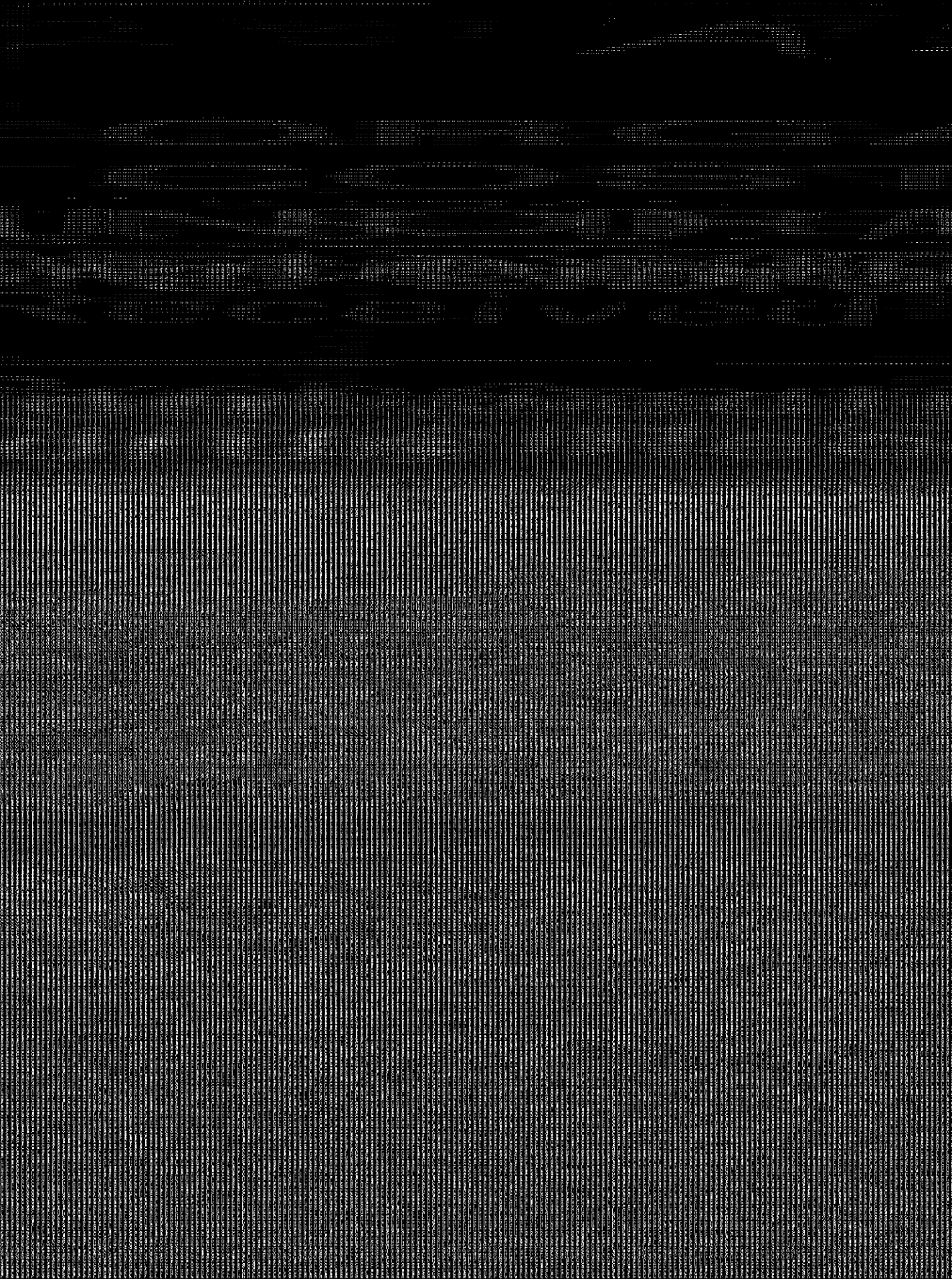


FARM COSTS AND RETURNS STUDIES

This report is part of a continuing nationwide study of costs and returns on commercial farms and ranches in selected farming regions. The study is conducted under the general supervision of Wylie D. Goodsell, Farm Production Economics Division, Economic Research Service. Objectives, methodology, procedure, and terms are uniform for all areas studied.

The costs and returns studies cover the following commercial farms and ranches by type and size:

Dairy Farms, Southeastern Wisconsin and Central New York
Cash Grain Farms, Corn Belt
Hog Beef-Feeding Farms, Corn Belt
Cotton Farms, Mississippi Delta
Cotton Farms, Southern High Plains, Texas
Tobacco Farms, Coastal Plain, North Carolina
Tobacco-Livestock Farms, Bluegrass Area, Kentucky
Wheat-Fallow Farms, Pacific Northwest, Northern Plains, and Southern Plains
Northwest Cattle Ranches
Migratory-Sheep Ranches, Utah-Nevada
Southwest Cattle Ranches

Information on the studies can be obtained from Farm Production Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C. 20250

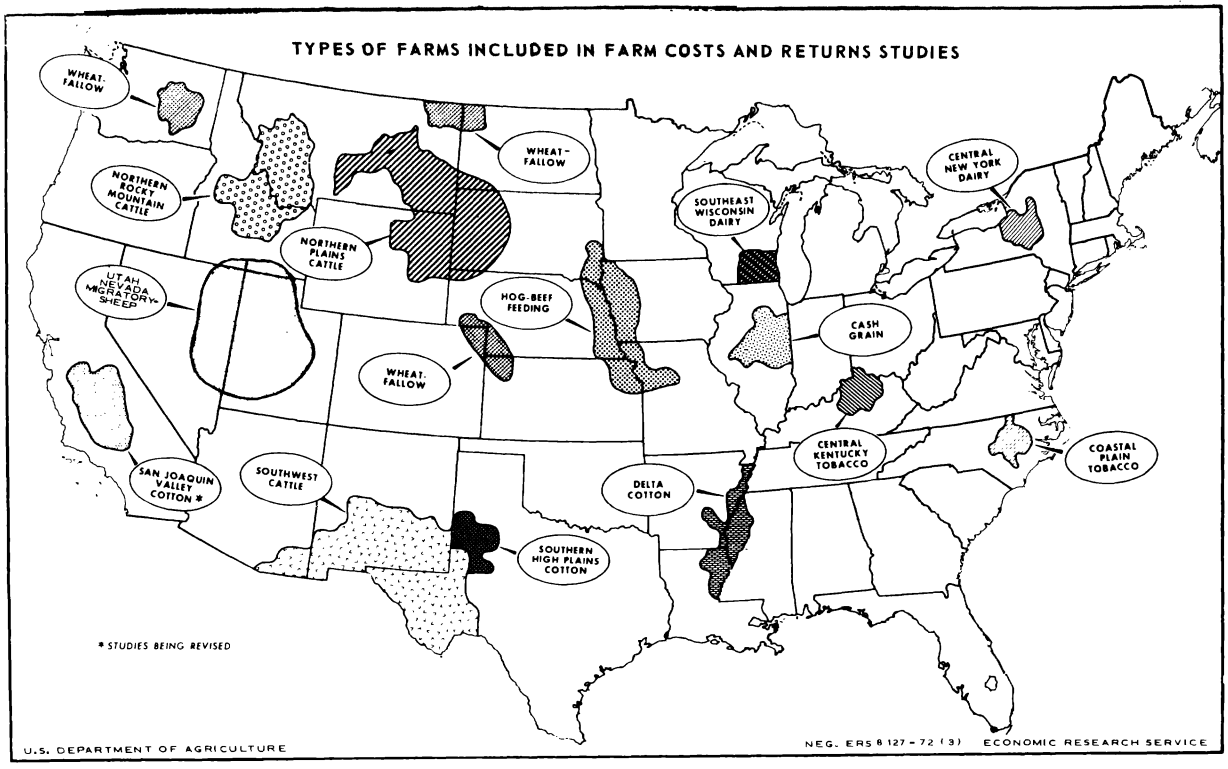


Figure 1

ABSTRACT

Net returns in 1971 were record high on viable commercial cattle ranches in the Northern Plains and the Northern Rocky Mountain areas, 2 of the most important cow-calf producing areas in the United States. Record-high prices received for calves contributed most to higher returns. Better than average range conditions the last 5 years, a record-large breeding herd, calving rate, and calf market weights, and lower death loss also contributed to the top returns in the Northern Plains. In the Rocky Mountain area livestock prices advanced a little more than in the Plains but range conditions were less favorable than a year earlier and there was little change in breeding herd size. However, with calving rates remaining at the 1970 record level, and with lower death losses and new highs for calf market weights, total livestock marketings topped 1970's record by almost 5 percent.

Key Words: *Cattle, calves, investment, costs and returns, ranch income.*

ACKNOWLEDGEMENTS

The author expresses appreciation for assistance from ranchers; the Statistical Reporting Service, the Agricultural Stabilization and Conservation Service, and the Forest Service, U.S. Department of Agriculture; the Bureau of Land Management, U.S. Department of the Interior; the Farm Credit Administration; and the Production Credit Associations. Appreciation is also expressed to Macie J. Belfield for her efforts in the planning and preparation of this report.

Washington, D.C. 20250 September 1972

CONTENTS

SUMMARY

Net ranch incomes (returns to operator and family labor and management and to total capital) increased around 2½ times in representative Northern Plains and Northern Rocky Mountain cow-calf ranches between 1960-64 and 1971. Returns reached a record $31,500 per ranch studied in the Northern Plains and $31,800 in the Northern Rocky Mountains. From these estimates must be subtracted interest paid in mortgages, which left a return to operator and family labor and management and to operators equity of around $23,900 in Northern Plains ranches and $24,800 in Northern Rocky Mountain cattle ranches. Returns last year were well above those for other Western livestock operations studied in this series.

The cost of ranching advanced steadily during the 1960's. The index of prices paid for production goods and services in 1971, compared with the early 1960's, was a third higher for Rocky Mountain ranchers and up 40 percent for Northern Plains operators. Labor, machinery, and tax costs were notably higher.

Ranchers were able to offset rising input prices by obtaining more output per unit of input. In 1971, output per unit of input was a fourth higher than the early 1960's for the Northern Plains study area and 15 percent higher for Northern Rocky Mountain ranches.

Net incomes increased because a rise in gross ranch incomes from roughly $30,000 to $56,000 in both areas outdistanced a $5,000-6,000 rise in production outlays.

Higher gross incomes resulted from (1) higher prices received for feeder calves and other cattle and larger production per ranch, in turn reflecting (2) better range conditions, (3) higher calving rates and lower death losses, and (4) heavier market weights of calves.

Prices received for feeder calves varied widely during 1960-71, but rose an average of nearly 5½ percent a year to a record $38.50 per hundredweight, 50 percent over the 1960-64 average.

Because of better weather, improved range output, and greater crop production, net production per ranch was nearly a third higher in 1971 in the Northern Plains area and a fourth higher in the Rocky Mountain area.

Although range conditions are likely to vary considerably in these sparse rainfall areas, range forage conditons remained more favorable in 1967-71 than in the early 1960's, and there were no serious weather setbacks. Forage condition was more favorable for the Northern Plains, the area more subject to adverse growing conditions.

Changes in calf market weights are closely related to changes in range condtions. Accordingly, fall market calves weighed about 450 pounds in 1971 on Rocky Mountain ranches and 430 pounds on Northern Plains ranches, nearly 20 and 50 pounds higher than in 1960-61. Some of the increase also was due to crossbreeding, and some to the introduction of heavier breeds and improvement within breeds. Around 30 percent of the 1971 calves on Rocky Mountain ranches and 20 percent on Northern Plains ranches were crossbred. Crossbreeding is increasing rapidly.

Along with rising incomes, Western ranch operators have enjoyed capital appreciation. Appreciation in net ranch capital in the Northern Plains, a measure that reflects changing prices rather than changes in physical plant, amounted to $177,000 during 1960-71, or about $14,750 a year. In the Rocky Mountains, the comparable figures were $118,000 and nearly $9,800.

Total capital assets on the Northern Plains ranches averaged close to a half-million dollars in 1971, and nearly $350,000 on the Rocky Mountain ranches. For each dollar invested in cattle, $3 to $4 were invested in land, improvements, and related assets.

ORGANIZATION, COSTS, AND RETURNS NORTHWEST CATTLE RANCHES 1960-71

by
Wylie D. Goodsell, Agricultural Economist
Farm Production Economics Division
Economic Research Service

INTRODUCTION

Americans are carnivorous. In 1971, we ate 192 pounds of red meat each, much more than people eat in most other countries. Beef and veal, which gained steadily in consumption from 71 pounds 2 decades earlier, accounted for 116 pounds of the per capita total. U.S. beef production in 1971 was about 2¼ times the output 2 decades before, and was greatly improved in quality, since production of Choice grade beef was about 4 times greater than in 1950.

Furthermore, U.S. demand for beef is expected to double before the turn of the century, with a further perceptible increase in demand for high-grade production.[1] Supplying these demands will strain the productive capacities of U.S. cattle ranchers and feeders. How ranches are organized and managed, and their attractiveness as investments, will largely determine whether they will keep up with the increasing demand, or whether alternative sources will loom larger in the supply picture.

This report examines viable cow-calf operations, a major animal supply source of the beef industry, in the Northern Plains and the Northern Rocky Mountain Plateau. These are 2 of our major beef raising areas. Objectives are to outline the resources used, to focus on some of the changes and conditions that concern cattle ranchers, and to ascertain the competitive position of the industry.

Ranching Realities

Popular misconceptions about cattle ranching obscure the actual conditions. Owning a cattle spread is as prestigious today as it was in the early expansion and settlement days. However, the realities of beef cattle raising are rarely those of the popular image. If it's a herd in the countryside, the casual observer envisions a few animals on lush pasture, enclosed in neat fences with imposing buildings and picturesque landscape and surroundings. He assumes the operator has plenty of capital and leisure time, and that the operation is highly profitable, if only because of land appreciation.

If it's a Western spread, he envisions a large herd and miles of relatively dry, rough grazing land enclosed with a few strands of barbed-wire fence. He notes great distances between ranch houses with a few unpainted rustic buildings, corrals, stockades, and chutes. Sometimes he envisions part of the herd in a stockade. He imagines many picturesque cowhands on lively cowponies, swinging looped lariats with dexterity and shouting in uncertain rhythm as they ride through the excited herd. He sees no proverbial contented cows on these ranches.

The transcontinental traveler has difficulty finding the Western cattle ranch he envisioned and often returns home disappointed. If he toured in summer, he probably saw a dozen cows or heifers and their calves grazing along the fence at dusk. At midday, perhaps he saw 2 or 3 well-bred bulls leisurely basking in the sun. The breeding season is over, and the cows and heifers are on the summer range often far removed from the highway. If he traveled in early spring, it is calving time. The cows and heifers are in some protected area caring for their newborn. In reality, this is Big Sky country—where the man-land ratio is low, where ranch quarters are far from the highway, and herds are widely scattered.

To the casual observer, a ranch seems to be highly profitable. Furthermore, it is idealized as a good investment, a good wholesome way of life, and a good place for a family to get away from it all.

In actuality, a day spent working on a typical cattle ranch is often satisfying, but as often cold, wet, frustrating, and wearying. One wouldn't find the chuckwagon with hot tantalizing food and coffee close by. In the early days of almost unlimited open range and big cattle drives, the rancher hired many cowhands, and consequently he became the boss of a large crew. Cowhands and community folk alike took note of him. However, today, with 4-wheel drive vehicles that can go almost anywhere a pony can, with horse trailers to carry cowponies long distances over hard roads, with huge

[1] H. J. Hodgson and R. E. Hodgson, "Changing Patterns in Beef Cattle Production," *Agricultural Science Review*, Vol. 8, No. 4, 1970, p. 17.

tractor-trailers that carry upwards of 75-450-pound calves direct from the ranch, and with other mechanized equipment and improved roads and markets, large cattle drives are gone and ranchers hire few cowhands. But cattle ranching is still big business and requires considerable capital. It is not an in-and-out business, and many who have approached it on this basis have invested many burdensome hours and lost much money.

The typical cattle rancher puts down his roots and establishes himself in his community. True tenancy in livestock ranching is the rare exception. The rancher's investment is large. Owning and operating a spread requires around $1,000-1,500 total investment per brood cow. Stocking and maintaining a good breeding herd alone requires around $100,000. Add to this about $350,000 land investment and $25,000 machinery investment for a total investment of a half-million dollars.

Running a successful ranch takes much more than just a large initial investment. Imagination, ingenuity, alertness, and management ability are essential.

Cattle Industry Growth

The cattle industry, both raising and feeding, has grown as a consequence of hard work, improved management, and increased demand for beef. Demand for cattle has steadily increased. Per capita consumption of beef has gone up and up, while that for pork and lard has eased, and that for veal, lamb, mutton, and wool has declined more abruptly. The number of cows and heifers kept for milk has declined for years.

U.S. statistics dating back to 1867 report nearly 60 percent more stock sheep at that time than cattle and calves. This ratio soon changed in favor of cattle, and by 1884, when stock sheep numbers reached their record high, cattle numbers were almost on a par with sheep (fig. 2). Cattle numbers continued to increase in cycles of around 16 years, and by 1942 numbered about 55 percent greater than in 1884. Today, there are 55 percent more cattle than at the beginning of World War II.

Cattle production lends itself to a wide variety of physical and climatic conditions and therefore is common throughout the United States. About 2 farmers in 3 report owning cows and heifers, and beef cow and heifer numbers have increased greatly in all areas. Particularly large increases have taken place in the Southeast, mostly because of pasture improvement and the use of crossbred animals that withstand the hot weather, diseases and insects. In 1972, Georgia was the eighteenth ranking State in number of beef cows and

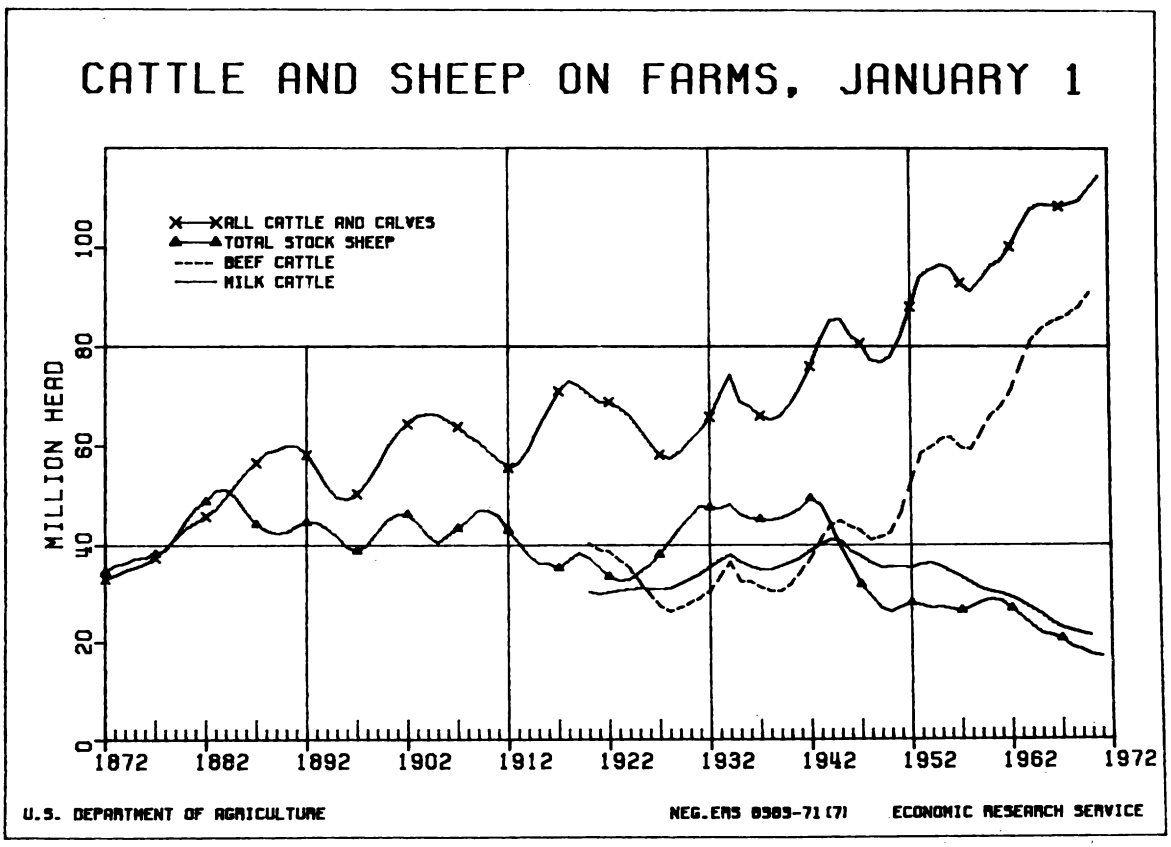


Figure 2

heifers, moving up from twenty-first in 1960 and showing a 6-fold increase over 1940.

The Western States have long been known for their importance in beef cattle production. Vast acreages of public land and open range there contribute much to beef raising. Livestock ranches comprise about 13 percent of the farms in the West compared with about 3 percent nationally (table 1). In the 1930's and early 1940's, a third of the Nation's beef cows were in these States. Since then the number of brood cows in the West has more than doubled. Yet they make up a declining part of the U.S. total, largely because of sharper increases in areas such as the Southeast.

Table 1.—Land area, land in farms, and type of farm, selected areas and United States, 1964

Item	Unit	Northern Plains[1]	Rocky Mountain[2]	Inter-mountain States[3]	Western States	United States
Land area	Thous. acres	55,016	29,916	397,933	752,853	2,266,273
Land in farms	do.	49,305	10,119	179,796	344,576	1,110,187
As percent of total land area	Pct.	90	34	45	46	49
Cows and heifers that have calved	Thous. hd.	891	427	4,414	8,368	47,342
Acres of farmland per cow	Acre	55	24	41	41	23
Type of farm:						
Cash grain	Pct.	13.8	8.7	20.8	14.4	19.4
Other field crop	do.	4.2	5.8	6.7	7.5	17.8
Vegetable	do.	.1	.1	.6	2.4	1.1
Fruit and nut	do.	([4])	.3	1.3	16.3	2.7
Poultry	do.	.5	1.4	1.3	3.1	3.9
Dairy	do.	2.4	9.6	10.9	11.3	17.6
Livestock, other than poultry, dairy and ranches	do.	28.8	42.6	27.8	19.6	24.6
Livestock ranches	do.	43.9	18.8	15.8	12.9	3.2
General	do.	6.3	12.7	14.8	12.5	9.7
Total	do.	100.0	100.0	100.0	100.0	100.0

[1] Consists of 15 counties in Montana, 8 counties in Wyoming, and 9 counties in South Dakota. [2] Consists of 12 counties in Montana and 7 counties in Idaho. [3] Consist of Idaho, Montana, Wyoming, Colorado, Utah, and Nevada. [4] Less than 0.05 percent.
Source: 1964 Census Agriculture

AREAS STUDIED

Two of the Nation's most important cow-calf producing areas are in the Northern Plains and the Northern Rocky Mountain Plateau (fig. 3). The Northern Plains livestock area includes 15 counties in southeastern Montana, 8 counties in northeastern Wyoming, and 9 counties in western South Dakota. The area has 11 percent of the brood cows and heifers in the 11 Western States, and has more beef cows than any Western State except Montana. Nearly half of the farms in the area are classified as livestock ranches.

The Northern Rocky Mountain area is a mountain and plateau area comprising 12 countries in southwestern Montana and 7 counties in east–central Idaho. These 19 counties have about 6 percent of the beef cows in the Western States and more than Washington, Nevada, Utah, or Arizona. The ratio of farms to livestock ranches is higher than in the Plains or Southwest (another important cattle ranching area, see fig. 3) because of the large number of crop and general irrigated farms alongside the rivers and streams in the mountain valleys.

Commercial cow-calf operations are very important in both areas. The typical viable unit has about 300 brood cows. Ranchers in the Northern Plains area graze their animals almost totally on private land under fence and graze them most of the year. A small amount of supplemental feeding is done in the winter months. These ranches generally carry more yearlings than in the Rocky Mountain area.

Rocky Mountain ranchers graze most of their animals on public range during the summer season. All of their livestock are on private range for a brief period in the spring and fall. The grazing season is much shorter than in the Northern Plains area, and heavy winter feeding is required.

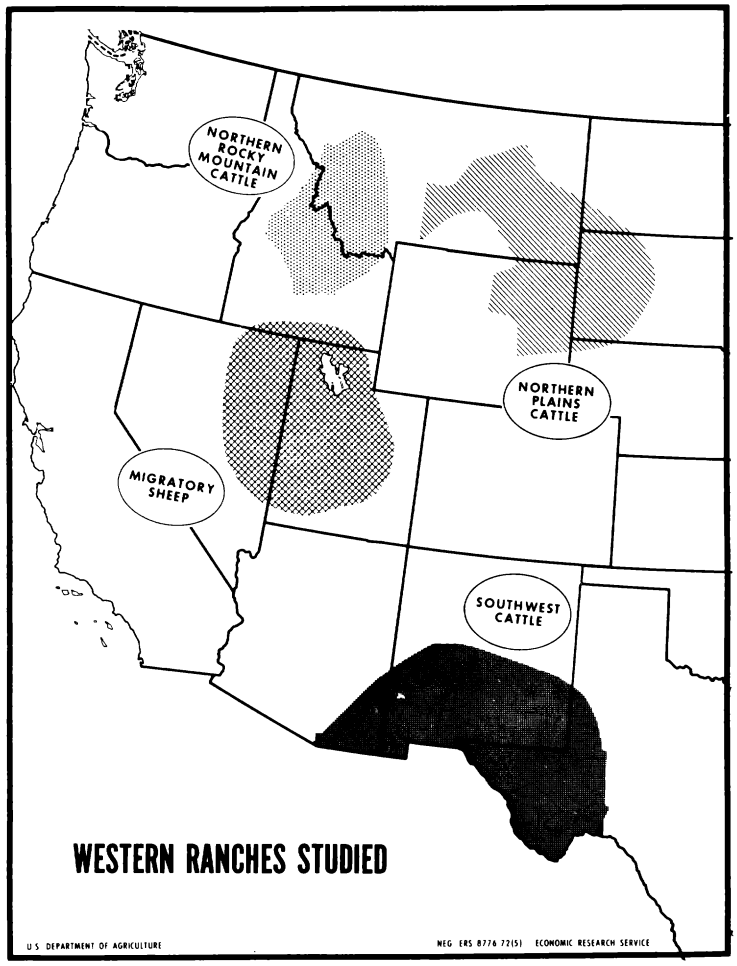


Figure 3

SOURCE OF DATA

Data for this study come from 5 main sources: (1) selected farm and ranch questionnaires from the Census of Agriculture; (2) questionnaires mailed to farmers and dealers by the Statistical Reporting Service; (3) enumerative field surveys; (4) information from the Forest Service, the Bureau of Land Management (BLM) U.S. Department of Interior, the Agricultural Stabilization and Conservation Service, Production Credit Associations, local banks, county agricultural extension agents, and county assessors and treasurers; and (5) research results and related data from State experiment stations and Federal agencies, when this information relates importantly to the size and type of cattle producing units.

NORTHERN PLAINS AREA

The area studied is confined largely to 32 counties in southeastern Montana, northeastern Wyoming, and western South Dakota (fig. 3). It is the heart of cow-calf operations in the Northern Great Plains and is one of the Nation's most important feeder-calf producing areas. Immediately west of the crop farming and beef feeding areas of the Midwest, it is an important source of feeder calves for Corn Belt feeders.

The study area is typical of most Western grazing areas. The man-land ratio is very low and there is considerable variation in both physical and economic characteristics. However, the Northern Plains grazing community is more uniform than most others. Ranchers are less dependent on the general farming community for important inputs since they produce nearly all of their livestock roughage requirements. Cattle graze private land most of the year, with relatively light supplemental feeding in winter months. Except for a few sections of State land, there is relatively little dependence on publicly administered grazing lands.

Cattle are kept under fence throughout the year, and relatively few ranch hands are required.

Physical Characteristics

Topography

The physical features of this 55 million-acre area are characterized mostly by relatively large areas of flat to moderately rolling land. Most of it is grazed. There are no mountains to speak of. The highest elevation in the entire area is Harney Peak, which rises to 7,242 feet, not much higher than the Wyoming Plateaus 100 miles to the southwest. There are less than a dozen relatively small rivers; their tributaries lead to the Yellowstone and Missouri Rivers. Bordering these streams are narrow stretches of fairly productive soils used mostly to produce hay.

Precipitation

Annual precipitation is a scant 13.67 inches, and quite variable for an area of this type and topographic character. The lightest precipitation generally occurs in the lower areas of the open plains, and increases with the elevation. Because much of the rainfall occurs as showers of high intensity and short duration, the effectiveness of the precipitation depends much on the slope of the terrain, the type of soil, and the type of plant cover and vegetative matter.

The lowest annual precipitation recorded during 1930-70 at any official weather station in the area was 6.1 inches, and the highest was 22.9 inches. During the 40-year period, average annual precipitation for the area ranged from a little below 9 inches to nearly 20 inches. In 1931-60, heaviest monthly precipitation of nearly 3 inches occurred in June, and lightest, less than 0.5 inch in December (fig. 4).

Variability of annual rainfall is an outstanding characteristic of this area and of Western range country in general. Major droughts are not uncommon and lesser droughts occur from time to time. These droughts cause great fluctuations in the output of native forage plants, and in most instances reduce yields of hay and related forage. Droughts upset the balance of grazing material, livestock, and feed supplies and cause economic stress to ranchers and related agribusiness enterprises.

Sporadic snowstorms are common, and sometimes come with little warning. Such storms can raise havoc on the range and livestock losses may run high. Most storms, however, do not leave a heavy snowpack for any protracted period. Light grazing often resumes a few days after a storm—animals graze some in most months.

Temperature

This is Big Sky country and sunny days are usual. Light, fleecy clouds occasionally dot the sky for part of the day. Heavy cloud covers or fog are very rare.

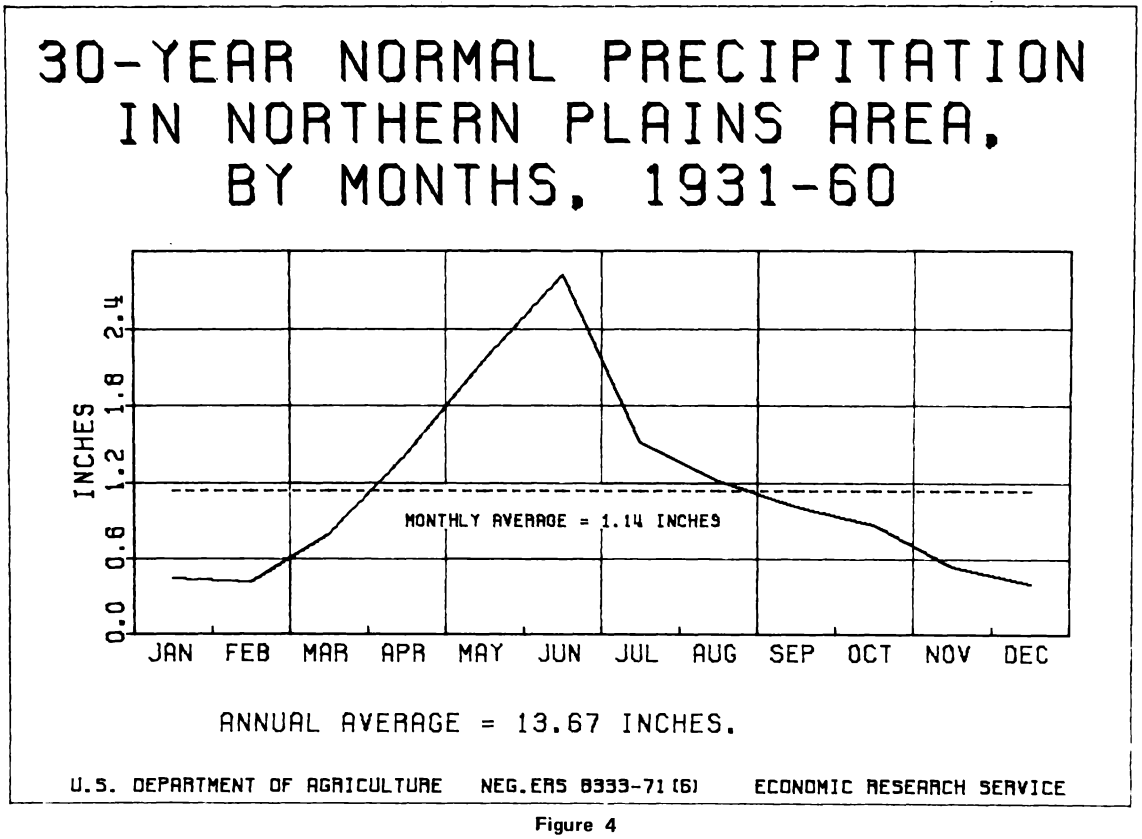


Figure 4

The humidity is characteristically low, particularly in the summer. Humidity from May to September ranges around 30 to 45 percent. Summer days are usually warm and the nights are moderately cool. A range of 50 degrees between daytime and nighttime temperature is not uncommon in summer. Midsummer days may have temperatures over 100 degrees, but they are not unpleasant as the humidity is generally low and breezes are common. Evening temperatures in the summer often go to the 40's and low 50's. Temperatures in winter often stay around the freezing level with numerous periods well below freezing. The average annual temperature is 45 to 50 degrees. Winds are common in these wide-open stretches of plains, particularly in spring, and may become strong any time of year.

Growing Season

The frost-free growing season in the Northern Plains study area generally ranges from 120 to 150 days. Because of relative uniformity in physical characteristics throughout the area, this season is reasonably uniform for most portions. Relative to many Western areas, this is considered a reasonably long growing period. Hay is by far the most important crop grown, and as it is quite temperature-tolerant, the growing season actually extends slightly beyond the 120-150 days.

Two crops of alfalfa hay are normally grown. Yields are low, as the crop is lightly irrigated and not heavily fertilized or intensively worked. Some native hay and small acreages of grain also are grown.

Short grass and mixed grass plant association are characteristic of the natural vegetation in the area. Sagebrush and salt species abound in many localities. With light snows in late fall and early spring to soften the browse and other dry vegetation, cattle can range most months.

Soils

As would be expected in a large area with rolling topography and small draws and valleys cut by streams, soil types vary considerably. The soils might be classed generally into earth-filled gravels, shales, clay shale, silty shale, silt loam, and sandy loam. Soils in the upland plains consist of well-drained shallow and moderately shallow coarse-medium and fine-textured soils. Silty clay loam and fine-sandy to gravelly soils occupy the benches, smooth stream terraces, fans, and valleys.

Soil drainage is generally not a problem. Water-holding capabilities of the soils vary widely. Soils located along the drainage and river bottoms afford good tillage and respond well to fertilizer. These are mostly in hay and small grains. The uplands are used mostly for grazing. The smoother uplands, which consist of fine sandy loams, afford some of the better grazing lands in the area.

Economic Characteristics

Nearly all land in this area is privately owned or deeded. Sections of State-owned land, around 2 sections per township, dot the area. Other than this, virtually no publicly administered land is available to farmers and ranchers. The little that is available usually is fenced, and for practical purposes is operated as part of an adjacent ranch. Cattle are operated under fence.

There are 2 relatively small National Forests in the area, Custer National Forest and Black Hills National Forest. These forests accommodate a negligible number of the area's cattle. Only those animals domiciled nearby are able to make economic use of this range.

Fast roads are practically nonexistent. Interstate 94 almost boundaries the area on the north and west and Interstate 90 runs slightly north of the southern boundary. There are few macadam or paved roads, and one major railroad, which parallels Interstate 94. Truck and branch lines carry the area's rail traffic. There are no major navigable streams, and except for the Black Hills National Park and Mouments, there are no major tourist attractions.

A few small independent feedlots have come into being in recent years, but to date there are no large feedlots, and thus there are no large markets. Practically all of the cattle are sold on contract or purchased direct in the fall by feeders or their agents.

Population

This area is sparsely populated. Population in 1970 totaled 370,000, only 41 percent more than in 1940. Population growth has been much slower than for the Intermountain or the Western States. The population is rural. Only 8 of the 32 counties in the area have a population of over 10,000 people and there are only 3 cities with a population in excess of 10,000. In 19 of the counties, there are no cities of over 1,000, and only 6 counties have as much as half their populations in towns of over 1,000.

The pattern of life and agriculture in the area characterizes much of the Plains from Mexico to Canada. The vast majority of ranchers live on the ranch rather than in one of the few small communities, a typical pattern for much of the Intermountain area.

Importance of Cattle Production

In 1965, nearly 9 farms in 10 in the Northern Plains study area reported owning cattle and calves. Nearly that proportion reported brood cows (table 2). This is a much higher ratio of cattle-producing farms to other types of farms than for the 11 Western States or Intermountain States. On the West Coast there are many orchards and crop-specialty farms, and in the Intermountain area there are many crop-specialty farms along with cattle operators.

Approximately three-fourths of the farms in the study area are classified either as livestock farms or farms on which livestock, other than dairy, are important (table 1). Less than half the farms in the Western States and less than two-fifths of U.S. farms are

Table 2.—Farms reporting cows and heifers that have calved, by size of unit, selected areas and United States, 1964

Item	Northern Plains[1]	Rocky Mountain[2]	Inter-mountain States[3]	Western States	United States
	Number	*Number*	*Number*	*Number*	*Number*
Farms reporting cows and heifers that have calved	10,034	5,200	77,505	167,321	2,051,438
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Percent of total farms	84.3	78.7	68.3	55.7	65.0
Percentage reporting:					
Under 50 head	49.1	58.3	70.2	75.5	90.6
50 to 99 head	22.9	17.6	15.0	11.7	6.3
100 to 199 head	17.7	13.6	9.2	7.5	2.1
200 to 499 head	8.4	8.5	4.5	4.2	.8
500 to 999 head	1.4	1.4	.8	.8	.1
1,000 head or more	.5	.6	.3	.3	.1
Percentage of total cows and heifers that have calved from units with:					
Under 50 head	10.9	11.3	19.2	19.2	51.9
50 to 99 head	17.9	13.9	17.9	16.0	17.9
100 to 199 head	26.6	21.0	21.5	20.1	11.6
200 to 499 head	26.0	27.5	22.6	23.7	10.1
500 to 999 head	10.0	11.3	9.4	10.4	4.1
1,000 head or more	8.6	15.0	9.4	10.6	4.4

[1]Consists of 15 counties in Montana, 8 counties in Wyoming and 9 counties in South Dakota. [2]Consists of 12 counties in Montana and 7 counties in Idaho. [3]Consist of Idaho, Montana, Wyoming, Colorado, Utah and Nevada.
Source: 1964 Census of Agriculture.

so classified. Furthermore, around 44 percent of the farms in the study area are classified as livestock ranches.

Many kinds and sizes of cattle enterprises are found throughout the United States. More than 90 percent have less than 50 head of brood cows. These small units are generally complementary or supplementary enterprises, or raise purebred animals, or are hobby farms. In the more extensive grazing areas such as the Northern Plains, there are few small herds or hobby enterprises, and the complementary and supplementary units are fewer in number and larger in size.

Fewer than half of the cattle enterprises in the Northern Plains study area have less than 50 head of brood cows. These are supplementary enterprises and in total produce less than 11 percent of the area's cattle. In contrast, these small units nationally produce more than half of the cattle. The study area also has many herds with 50-200 brood animals, mostly operated jointly with a wheat or sheep enterprise. Units with more than 200 brood cows, the bonafide commercial cattle ranches, produce nearly half of the area's cattle. In contrast, such units nationally produce less than a fifth of all cattle.

Brood cow population has increased much more rapidly in the Northern Plains study area than elsewhere in the West. The Southeast, particularly Florida, has shown comparable growth. Growth in the Southwest has been far below that in most major producing areas. In 1970, brood cow numbers in the study area were 2.8 times the number in 1940. In the United States, they were 1.3 times the 1940 level and in the 11 Western States were 1.6 times the 1940 level (fig. 5).

Ranches Studied

The ranches studied in the Northern Plains area are viable cow-calf units with around 300 head of good quality Hereford or Angus brood cows. About 18 sections of land, 11,500 acres, are required to carry these animals. Cows are bred to high-quality bulls to calve, hopefully, in April or May. Around 90 percent of the cows and heifers of breeding age conceive and produce a calf each season. Most calves, except those held for herd replacements, and a few lighter weight animals held a few additional weeks for further growth, are sold in October-December, at 390-425 pounds.

Most ranchers and cattle ranch experts agree that 200 brood cows and heifers are a minimum, and that the minimum is increasing on ranches that stay in business. This is particularly true if the rancher is full time, handles normal ranch financial obligations, and takes advantage of technological changes and good management techniques. A number of ranches with more than 600 brood cows are father-son arrangements, partnerships, or other ownership combinations. Because of these considerations and ranch management information, limits of ranches for the study were set at 200 and 600 brood cows. However, management practices and input-output data for ranches of around 300 brood cows were used in estimating costs and returns for the typical ranches. Cattle units in the 200-600 range account for around a third of the area's production, and are typical of a large number of cow-calf operations in the Plains States.

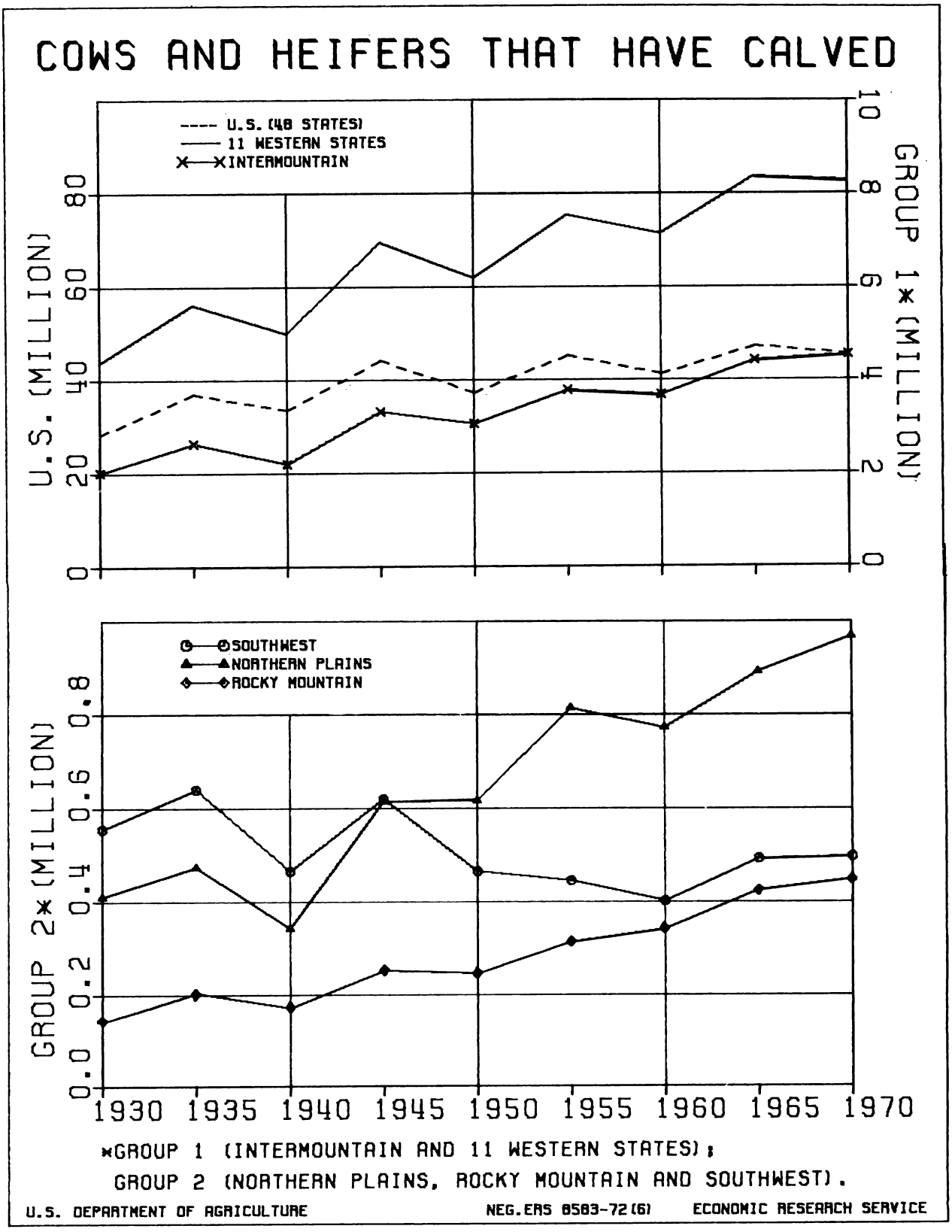

COWS AND HEIFERS THAT HAVE CALVED
---- U.S. (48 STATES)
—— 11 WESTERN STATES
×—×INTERMOUNTAIN
U.S. (MILLION)
GROUP 1* (MILLION)
0
20
40
60
80
0
2
4
6
8
10
⊙—⊙SOUTHWEST
▲—▲NORTHERN PLAINS
◇—◇ROCKY MOUNTAIN
GROUP 2* (MILLION)
0.0
0.2
0.4
0.6
0.8
1930
1935
1940
1945
1950
1955
1960
1965
1970
*GROUP 1 (INTERMOUNTAIN AND 11 WESTERN STATES);
GROUP 2 (NORTHERN PLAINS, ROCKY MOUNTAIN AND SOUTHWEST).
U.S. DEPARTMENT OF AGRICULTURE
NEG. ERS 8583-72(6)
ECONOMIC RESEARCH SERVICE

Figure 5

Ranch Organization

Land Base

The land base on a viable Northern Plains cattle ranch includes about 14 operator-owned sections and 4 rented sections. Rented areas usually include 2 sections of privately owned grazing land and 2 sections of State-owned land (table 3). The latter is mostly State "school sections," usually the sixteenth and thirty-sixth sections in a township. This land was given to the State on admittance to the Union. Proceeds to the State from rental or sale of the land is meant to assist the State educational system. For the most part this land has been held intact, although some has been sold. States also own additional lands acquired through various enabling acts. Ranches rent this land on a stipulated fee per animal-unit-month (AUM) of grazing.[2] The fee is usually based on the relative grazing capacity of the land. There is very little Federally administered open grazing land in the study area.

Table 3.—Northern Plains cattle ranches: Land use per typical ranch studied, 1971[1]

Item	Acres	Item	Acres
Total land operated	11,500	Cropland harvested	253
Grazing land	11,160	Small grain	36
Owned	8,600	Alfalfa hay	146
Rented:		Mixed hay	71
Private	1,280	Other land:	
State and Federal	1,280	Cropland not harvested	47
		Improved pasture	25
		Farmstead and other	15

[1] Preliminary.

The rancher usually rents the privately owned grazing land for a fee per AUM of grazing. Both the State and private leased lands are usually fenced and operated in conjunction with rancher's private land. The carrying capacity of grazing lands in the study area is generally not high, but it ranks well in productivity relative to most Western grazing land. Total ranch land per animal unit generally averages around 30 acres.

There are around 300 acres of cropland per ranch, varying greatly in productivity. Some of the marginal land may produce a crop if rainfall is adequate or if there is sufficient irrigation water. Otherwise, this marginal cropland is used as pasture or grazing land or is idled in a particular year. The meadows and better situated lands produce a crop of native hay, alfalfa, or mixed hay. A small acreage, 25-35 acres, is used in the production of grain, often a nurse crop for new seedings of hay. Much of the harvested grain is used to supplement hay, particularly for first-calf heifers.

Land is not intensively cropped and yields are relatively light. Native hay yields range from one-third ton per acre in a poor year to almost a ton per acre in a good year. The 1960-71 average was two-thirds ton per acre. Tame hay yields range from around 0.6 ton to 1.4 tons per acre. Total hay production per ranch ranged from around 95 tons in 1961 to nearly 260 tons in 1971. Total grain production varied from around 260 bushels per ranch in 1961 to nearly 1,300 bushels in 1968. Consequently, total hay and grain production per ranch varies widely from year to year, presenting a challenge to the rancher's livestock-feeding program. The normal hay requirement is 1,300 pounds per animal wintered, making a total ranch consumption of 260 tons, slightly under normal production.

A small amount of land per ranch is irrigated, mostly by flooding, and not intensively or systematically. Irrigation water is scarce and the supply is highly variable. Since irrigation relies on gravity flow and much of the land is uneven some land gets little water. However, the land responds well to irrigation.

The Cattle Enterprise

The total breeding herd, including replacements, averages around 365 head per ranch. This includes around 300 cows and heifers of breeding age, a dozen bulls, and around 55 replacement heifers. The January livestock inventory includes a number of calves to be sold shortly and a few animals to be sold later in the summer if range production is good (table 4).

Table 4.—Northern Plains cattle ranches: Cattle per ranch January 1, 1960-72[1]

Year	Total cattle	Brood cows and heifers	Calves		Bulls
			Heifers	Steers	
	Number				
1960	432	294	65	61	12
1961	437	297	70	58	12
1962	424	288	68	56	12
1963	429	287	73	57	12
1964	439	294	75	58	12
1965	463	310	74	67	12
1966	461	300	78	71	12
1967	458	311	73	62	12
1968	470	306	80	72	12
1969	468	309	79	68	12
1970	468	303	84	69	12
1971	487	311	88	76	12
1972[2]	492	317	87	76	12

[1] Study area consist of 15 counties in Montana, 9 counties in South Dakota, and 8 counties in Wyoming. [2] Preliminary.

The base breeding herd of brood cows, replacement heifers, and bulls remains fairly constant from year to year. The largest change, 16 head per ranch, occurred between 1964 and 1965, concluding a 4-year buildup (table 4). This buildup began in 1962 with a price of better than $30 per hundredweight for fall range calves,

[2] An animal unit for grazing purposes usually consists of any animal over 6 months of age.

the highest calf price in 4 years. A buildup in breeding herd appears to follow a few years of strong calf prices and good range conditions. If such conditions do not prevail and price prospects are not good, breeding herds are cut, but year-to-year changes are usually comparatively small. This is because of built-in economies of scale on these ranches. The carrying capacity of land is relatively fixed, land is expensive, and additional land accessible to the operating unit is seldom available at prices ranchers want to pay.

Breeding and replacement animals are of good quality. They are bred for a temperament to range well, to breed well, and to make good gains under conditions prevailing in this general area. The cows and heifers of the Hereford and Angus breeds have had good calving and production records. Heifers are commonly bred to calve at 2 years of age. Most ranchers give special care to selecting bulls to breed young heifers and to precondition first-calf heifers for calving. Brood cows and heifers are kept in the breeding herd as long as they conceive and produce a good calf and can manage for themselves on the range. Labor is expensive and special pasture usually is not available, so brood cows with problems are culled and marketed.

Around 17 percent of the cows 2 years and older are replaced each year. If losses occur because of a difficult winter or a freak snowstorm, the ranchers attempt to replace lost or problem cows either with his own heifers or purchased animals. Ranchers usually hold back a few extra heifer calves to take care of normal death losses of heifers and other contingencies. This particularly accounts for the extra heifers in the inventory (table 4, column 3).

More operators, particularly of the larger units, are resorting to a small yearling program, although the cow-calf plan is still the predominant operation. The yearling program involves the carryover of some late calves and lightweight animals too small to sell advantageously in the fall. Many of them are sold shortly after the first of the year after they have gained weight, but some are carried into the summer and are sold as yearlings. This allows flexibility in operations and permits the use of any extra hay or extra spring or summer range.

The ratio of breeding bulls to brood cows varies from ranch to ranch depending on the age, type, and condition of bulls and cows, the topography and productiveness of the range, and the management practices followed by the ranch operator. As a rule, about 4 bulls are kept per 100 cows and heifers of breeding age. In 1971, the general range on these ranches was from about 3.3 to 5.2 bulls per 100 cows and heifers of breeding age.

Some ranchers do not test bulls for fertility or are slow to replace old bulls and therefore keep a few additional bulls to assure a high calf crop. Breeding programs may include division of herds into smaller groups to ensure more complete breeding by bulls, or confinement of first-calf heifers with young bulls. Ranchers with good pasture or range, ample stockwater, and a good stocksalting program, and ranchers who condition bulls and heifers prior to the breeding season are able to do a good job of breeding with a minimum number of bulls. Ranchers who run bulls at random with cows and heifers or who have poor range usually get poor calf crops and are unable to keep a short herd calving period.

Artificially inseminating or impregnating cows also reduces the number of bulls carried per 100 brood cows and heifers, and permits the rancher to obtain offspring from top quality bulls, thus upgrading his herd. Although the proportion of cows and heifers artifically impregnated is small, the number bred this way is increasing. Artificially inseminating beef cows has taken on new dimensions in recent years because of the new emphasis given to crossbreeding programs on many ranches.

Ranch Production

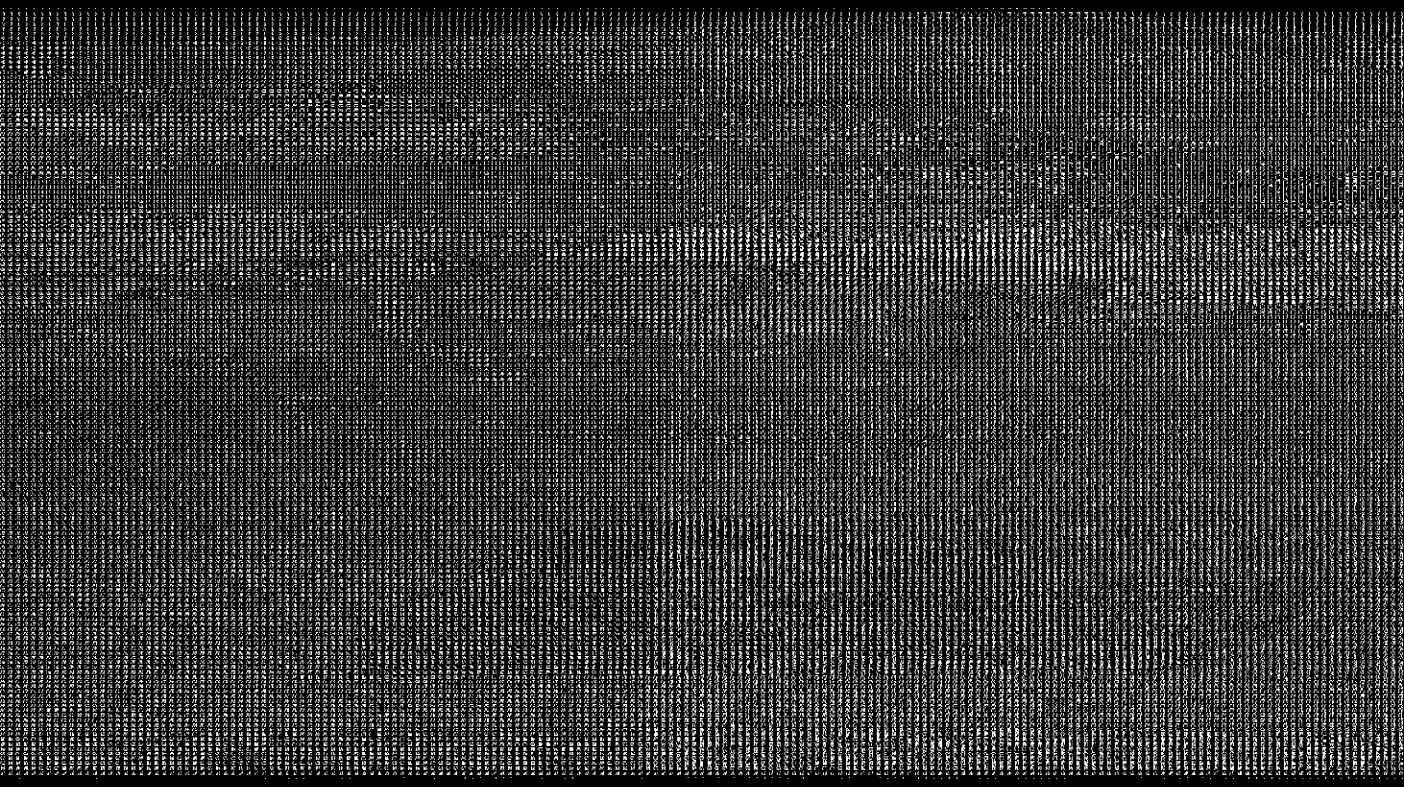
Net ranch production (combined net physical output of all ranch products) has gone up significantly in the last dozen years, and particularly in the last 8 years. The index of net ranch production in 1967-71 averaged about one-fifth above the 1960-64 average (fig. 6). This occurred despite no change in acreage per ranch and a modest 5-percent increase in brood cows per ranch.

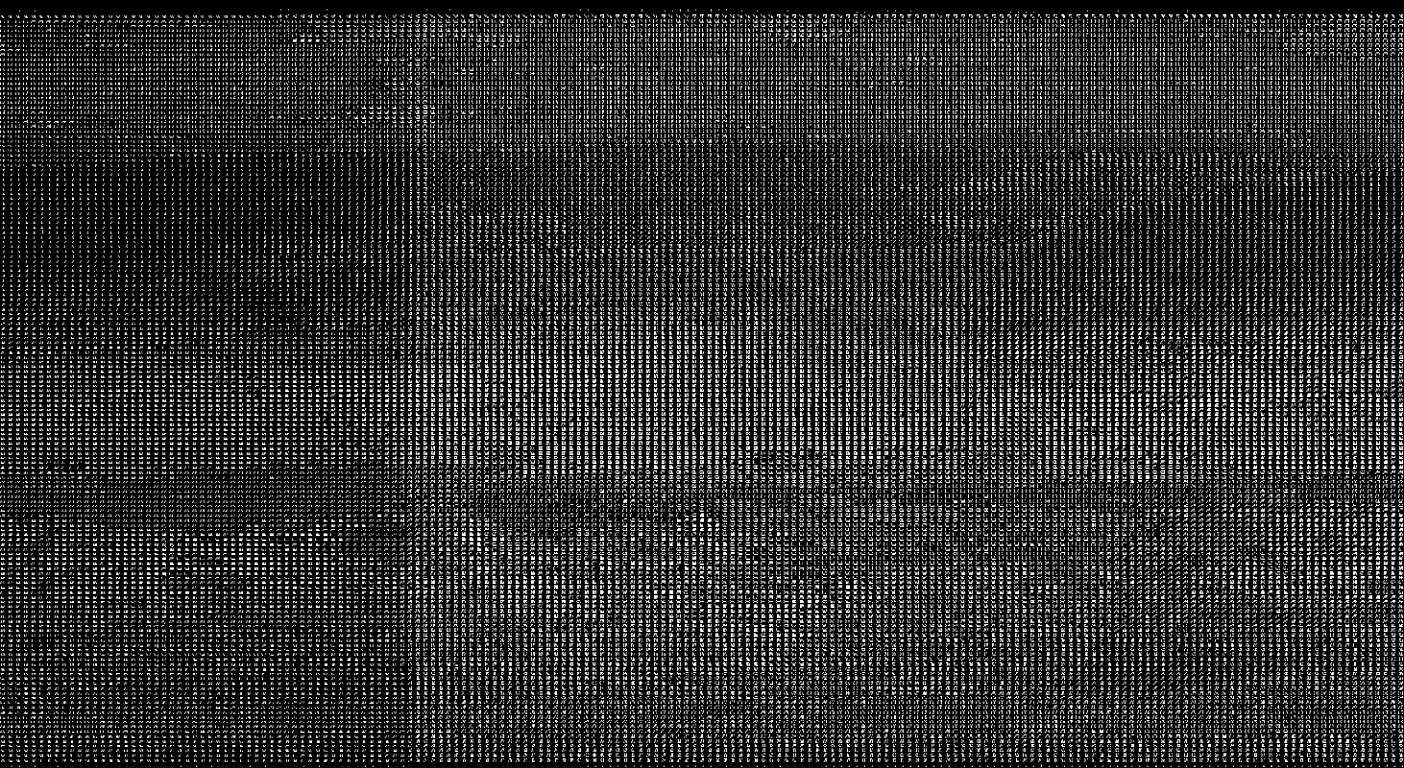
Several factors contributed to the increase. Among these were a significant increase in market weight of calves, a small but consistent increase in calves born and marketed per 100 brood cows, a significant increase in crop production, and improvement in range conditions.

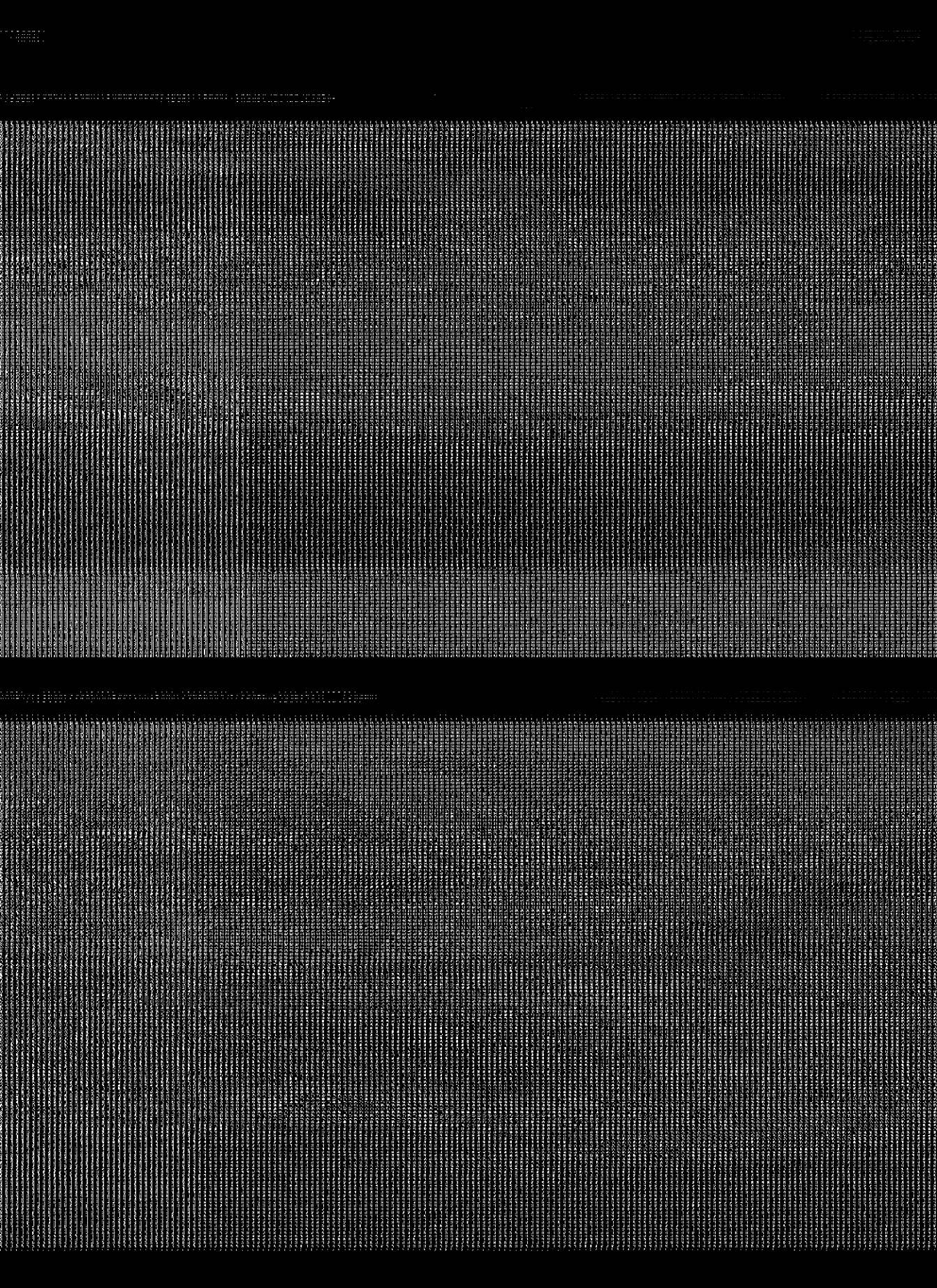
Market Weights and Crossbreeding

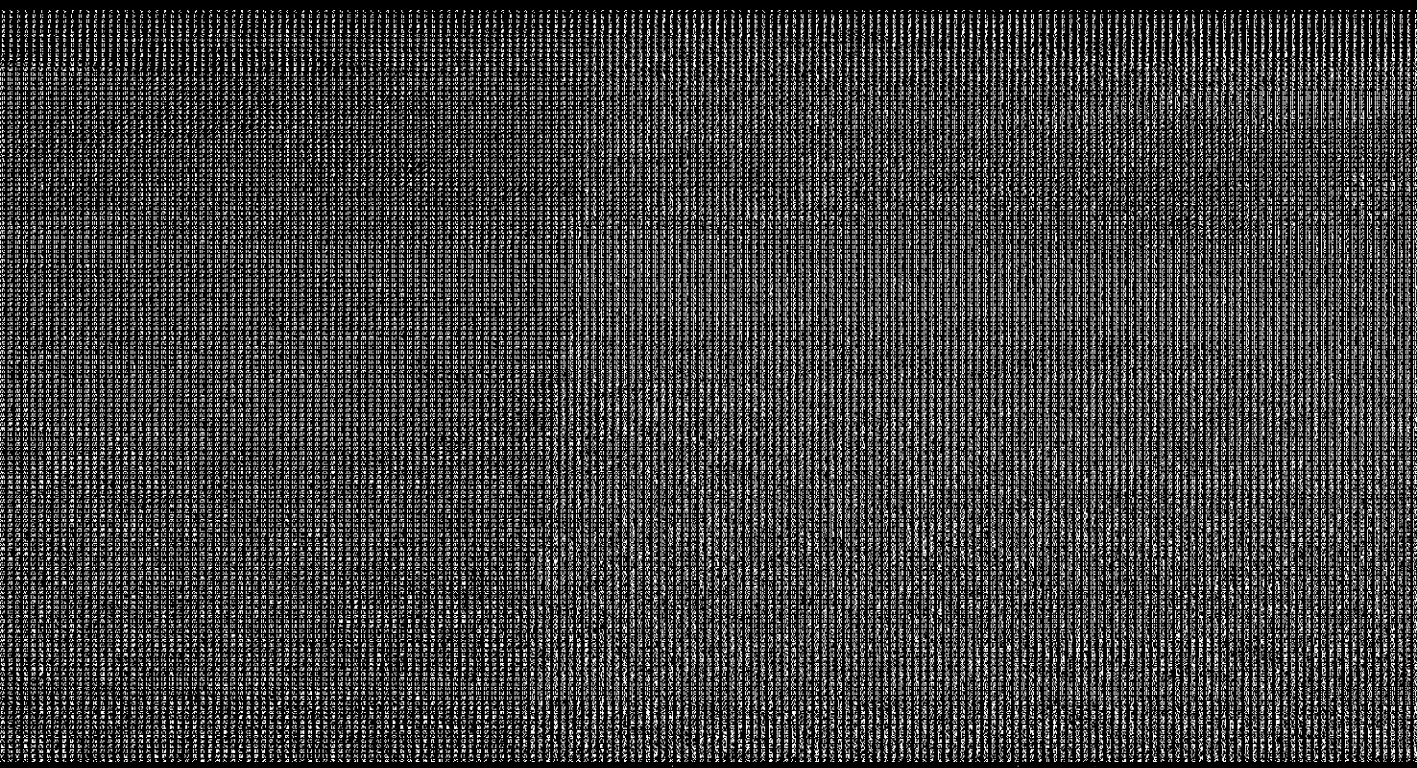
The average market weight of fall calves sold from Northern Plains cattle ranches increased significantly during the 1960-71 study period (fig. 6). Average market weights in the last 5 years were up nearly 8 percent from the 1960-64 average. Three factors were primarily responsible: a general improvement in range forage conditions, better management, and more crossbreeding. A small contribution came from a slow but gradual upgrading of breeding herds and the introduction of heavier breeds. Much of the trend to heavier breeds has come by artificial insemination via importation of semen from bulls of the larger breeds, such as the Charolais, Simmental, Limousin, Murray Grey, Welsh Black, and Chianina. Examples of some of the major breeds used for crossbreeding are shown on the following pages.

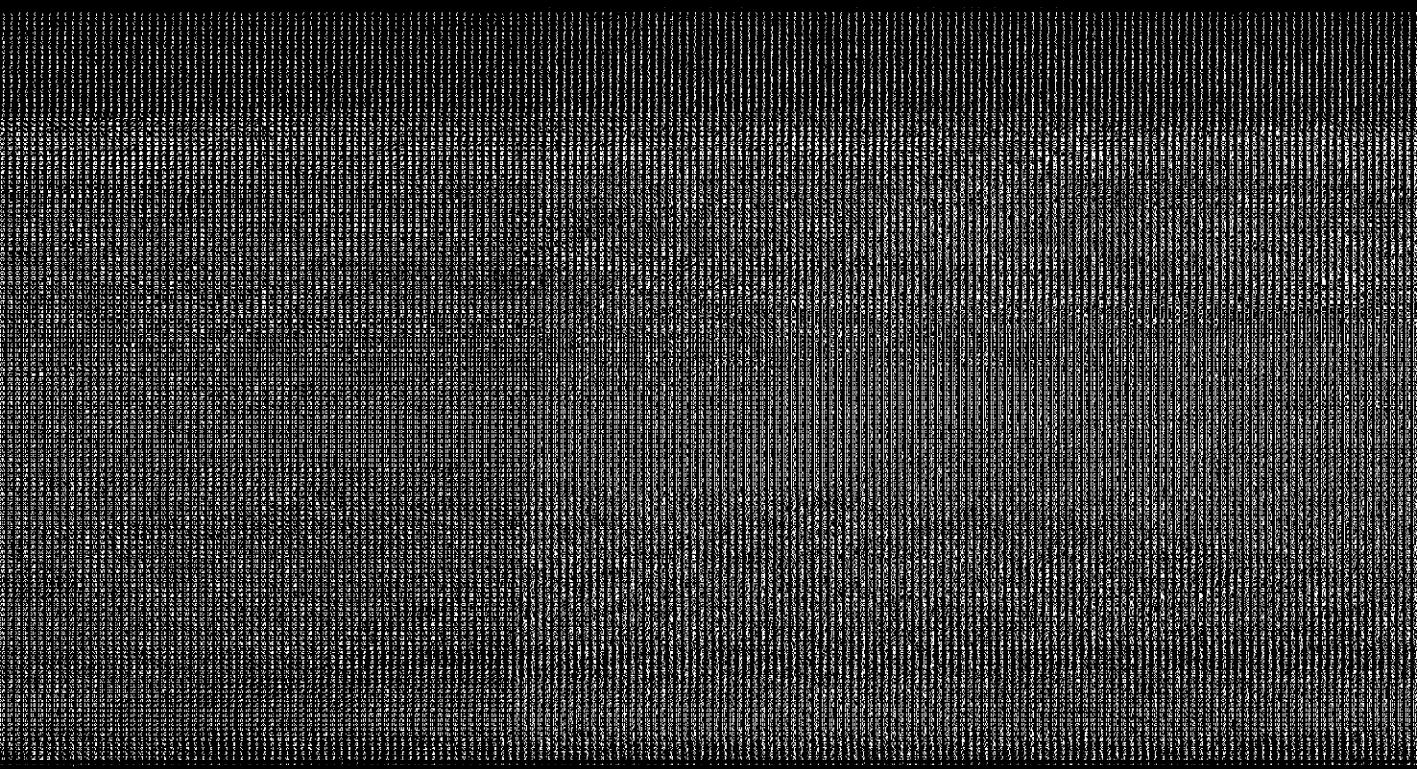
Ranchers generally report very favorable results from crossbreeding. According to records of Western cattle ranchers, 1970 mid-April calves from Angus females bred to Charolais bulls averaged around 520 pounds per head at marketing in early November, nearly 100 pounds above the area average. Mid-March calves from the same cross weighted around 600 pounds on the November

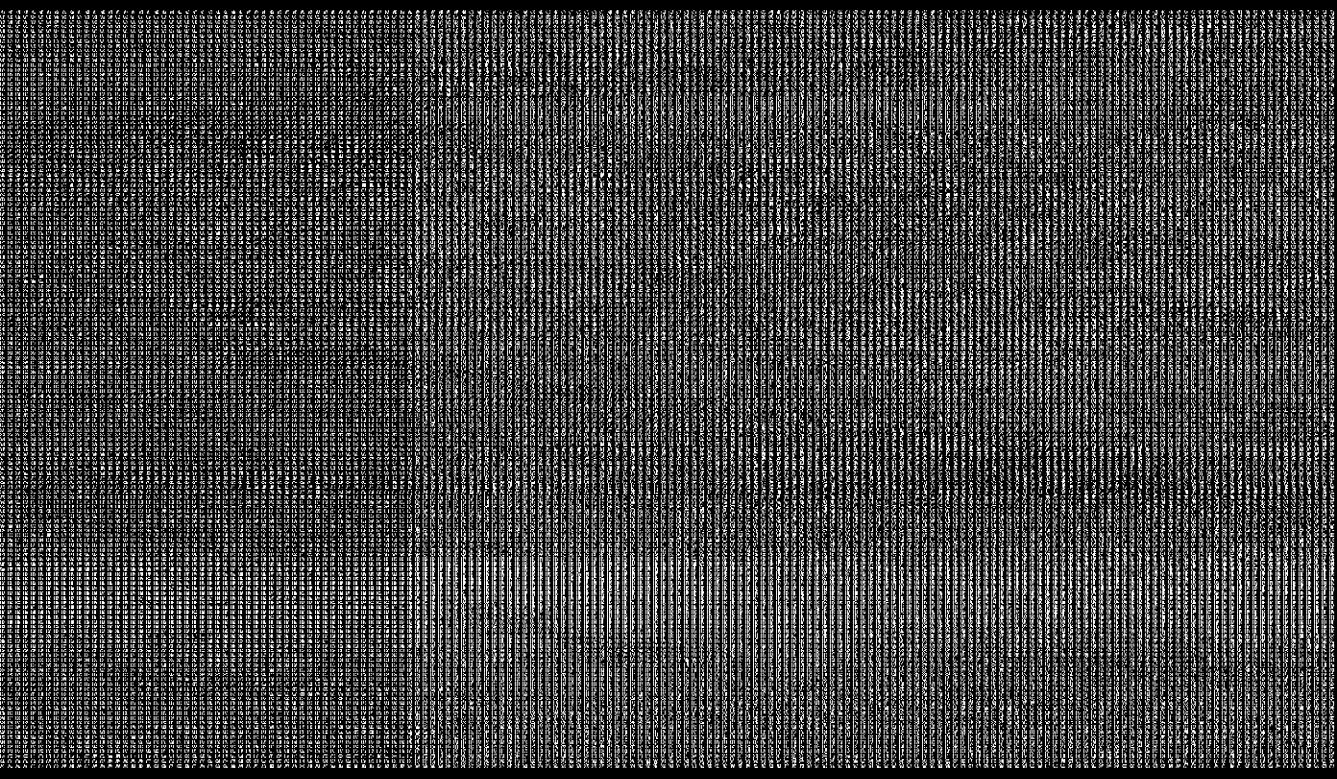


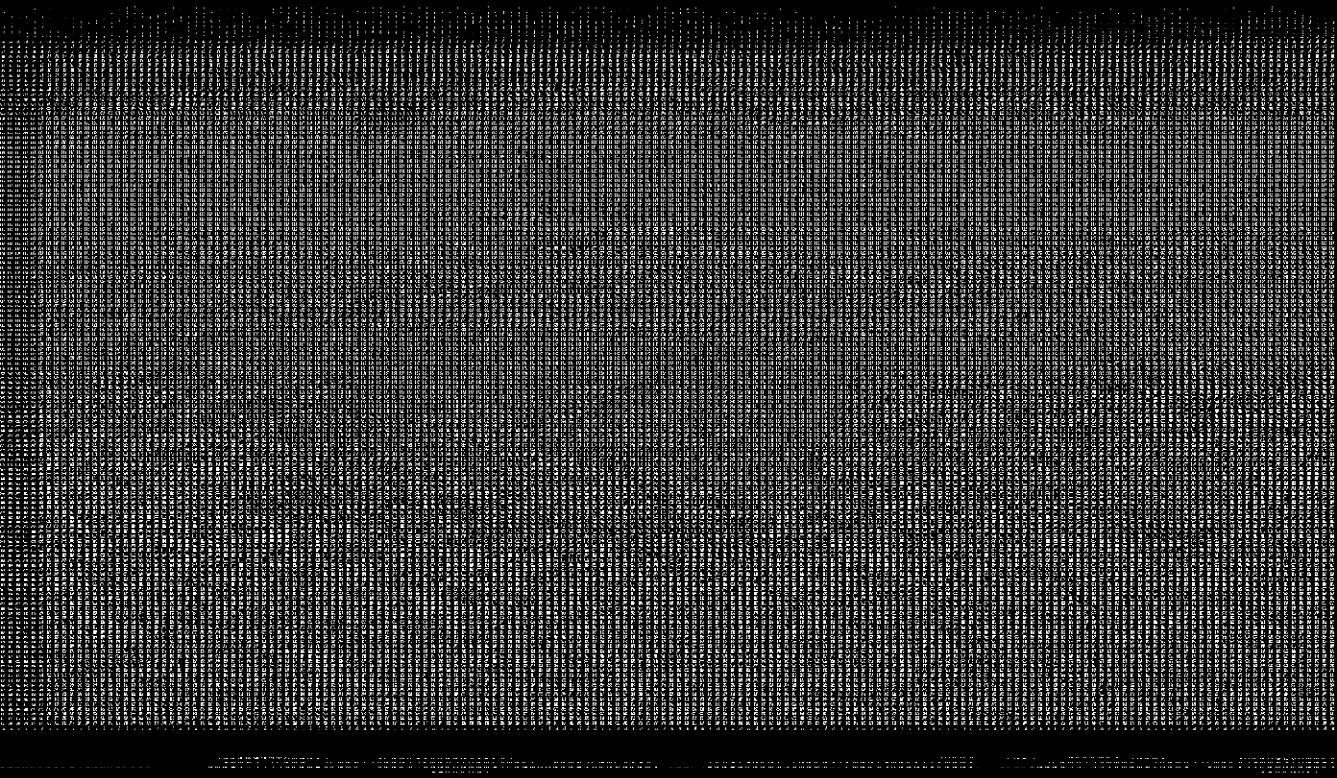












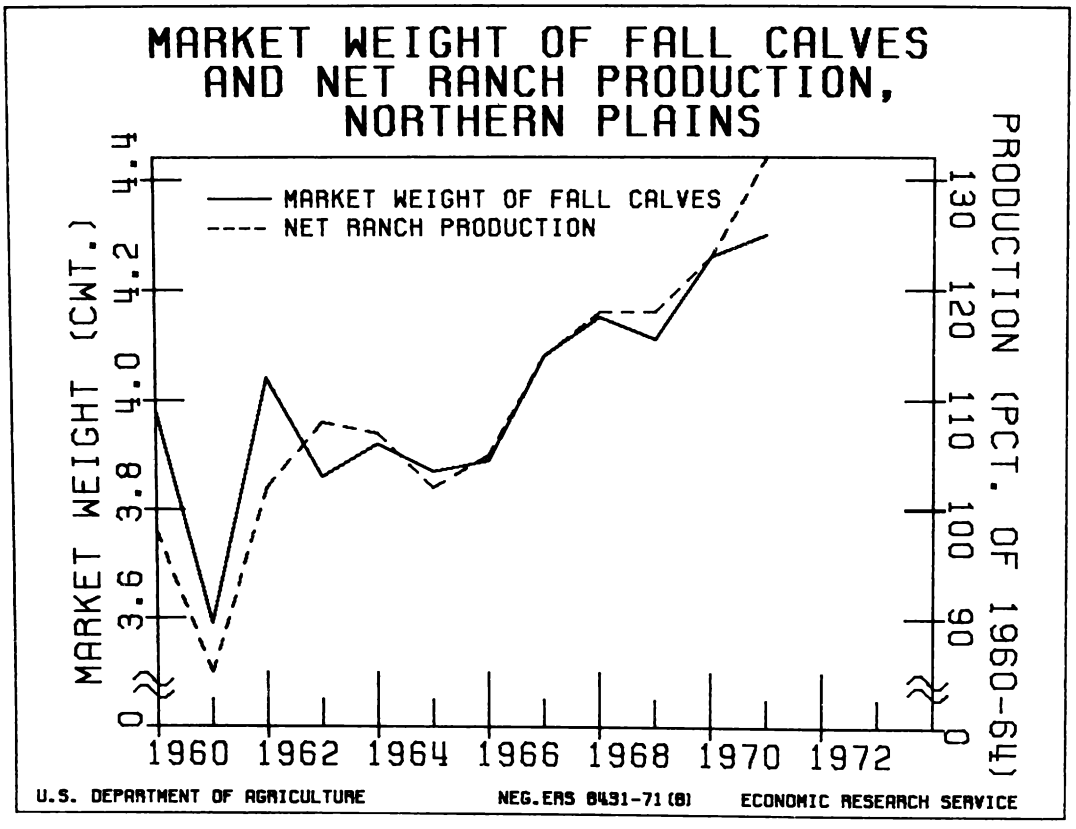


Figure 6

date. However, the calving date for these crossbred animals was earlier than for most herds in the area. Nevertheless, when adjustments are made for calving dates, the advantage is in the progeny from the crossbred animals. Average daily gains of crossbreds are superior to the area average.

In Western cow-calf operations, extra weight on fall market calves is almost clear profit. Market weight of calves has a significant influence on net ranch production and income.[3] Assuming the summer range will support the additional calf production with no increase in acreage, operating and overhead costs will be little different for a 425-pound or 525-pound fall market calf. Assuming a discount of 4 cents per pound from the 1971 average market price of $38.50 per hundredweight for the heavier market calf, a rancher selling 250 calves at the heavier weight would obtain around $8,600 extra profit. Advancing the calving date, which is easier in crossbred females, also increases calf market weights and thus, profits.

Experiments at Federal and private breeding stations reaffirm ranchers' experience. Advantages in a good crossbreeding program include:

1. Earlier sexual maturity
2. Earlier conceptions
3. Higher conception rate
4. Fewer calving problems
5. Higher percentage calf crop
6. Higher milk production
7. Heavier calves at weaning
8. Greater heat and insect resistance
9. Greater livability
10. Greater longevity
11. Better climatic adaptability
12. Greater variety of animals and characteristics from which to choose.

According to information from the U.S. Meat Animal Research Center, Clay Center, Nebr., a systematic crossbreeding program may be expected to produce about 23 percent more pounds of calf per cow in the herd than straightbred animals. Approximately 8 percent comes from a higher calf crop from crossbred cows, 4 percent from greater calf livability of crossbred calves, and 11 percent from faster growth with more than half of this associated with more milk produced by crossbred dams. Furthermore, crossbred heifers come into their first heat earlier and a higher percentage of them are "settled" at the first service. Thus, in a crossbreeding program there is the advantage of about a 2-week longer calf-growing period before market time.

Further evidence of the advantages of crossbreeding for market calves is given in table 5. These are preliminary results from experiments at the Meat Animal

[3]The correlation coefficient is 0.889, and the regression coefficient is 0.05447.

Table 5.—U.S. Meat Animal Research Center herd: Calves by breed, 1970 calf crop[1]

Breed of sire	Breed of dam	Calves weaned	Birthweight	Average daily gain	200-day weight
		Number	*Pounds*	*Pounds*	*Pounds*
Hereford	Hereford	55	80	1.82	445
Angus	Angus	66	72	1.95	463
(14 bulls)	Average	121	76	1.89	454
Angus	Hereford	59	81	1.90	460
Hereford	Angus	87	78	2.01	479
(14 bulls)	Average	146	80	1.96	470
Jersey	Hereford	53	73	1.90	452
(12 bulls)	Angus	71	66	1.90	444
	Average	124	69	1.90	448
South Devon	Hereford	28	85	1.90	466
(14 bulls)	Angus	39	81	2.00	482
	Average	67	83	1.95	474
Limousin	Hereford	70	87	1.94	476
(6 bulls)	Angus	63	84	2.06	496
	Average	133	86	2.00	486
Simmental	Hereford	65	93	1.99	491
(8 bulls)	Angus	78	85	2.09	503
	Average	143	89	2.04	497
Charolais	Hereford	68	92	2.03	498
(10 bulls)	Angus	76	85	2.11	507
	Average	144	88	2.07	502
Average all	Hereford	398	84	1.93	470
Sire Breeds	Angus	480	78	2.02	482
	Average	878	81	1.97	476

[1] Preliminary data, U.S. Meat Animal Research Center, Clay Center, Nebr.

Research Center but the results are similar to those reported by ranchers.

The large amount of crossbreeding nowadays is certainly perceptible in feedlots. Buyers, feeders, and other experts place the proportion of first progeny from crossbred animals at almost 25 percent in the Northern Plains and at 30-40 percent in the Rocky Mountain area. Operators of herds as large or larger than the size studied here are more inclined to crossbreeding than are the operators of the smaller spreads. Crossbreeders with small herds have more problems in maintaining a breeding herd.

Some ranchers interviewed felt they might encounter more calving problems in a crossbreeding program. Many avoided crossing young heifers. First-calf heifers generally have more problems in calving than do older animals. However, many of these problems can be avoided by proper selection of breed of sire, as shown in table 6. The number of animals used in the experiments reported in table 6 may have been too small for conclusive results. However, there was a tendency for heifers to have problems in delivering their calf when bred to animals of the heavier breeds such as Charolais, Simmental, and Limousin. Angus and Hereford first-calf heifers had few calving problems when bred to Jersey bulls, and they produced relatively good-gaining calves (table 5). Hereford heifers generally had more calving problems from crosses than did Angus heifers. Angus heifers generally scored well.

As would be expected, fewer calving problems were encountered in mature cows. But crosses with the larger breeds produced more problems (table 7). Relatively few problems were recorded in Hereford-Angus and Jersey-Angus and Jersey-Hereford crosses.

In the late 1950's and early 1960's, crossbreeding on Western cow-calf ranches was almost unthought of. Ranchers took pride in their uniform herds, and calf buyers paid premiums for "lots" of such animals. Thus, great emphasis was directed to improving within the breed. As a result there are more differences today in animals within breeds than among most breeds.

Feeders prefer upstanding, lengthy animals that have good growth potentials as well as finishing abilities. These qualities may be obtained via crossbreeding. Alert cow-calf operators know this but they also realize they can't sacrifice their base breeding stock.

The Hereford has long been the preferred breed on Western ranches. Herefords have good length and body conformation and are relatively slow in maturing (fig. 7). Consequently, Hereford calves are generally prized by feeders looking for growth-gain coupled with finishing ability.

Angus cattle are the second most common breed in the West. Although there are many upstanding, lengthy

Table 6.–U. S. Meat Animal Research Center: Calving score of 2-year old heifers by breed, 1970 calf crop[1]

Breed of sire	Breed of dam	Calves	Calving difficulty score[2]					Dead at or shortly after birth
			1	2	3	4	Total	
		Number	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Hereford	Hereford	25	40	56	4	0	100	0
Angus	Angus	44	68	32	0	0	100	9
	Average	69	58	41	1	0	100	6
Angus	Hereford	37	51	49	0	0	100	14
Hereford	Angus	50	70	30	0	0	100	6
	Average	87	62	38	0	0	100	9
Jersey	Hereford	27	81	19	0	0	100	0
	Angus	44	98	2	0	0	100	2
	Average	71	92	8	0	0	100	1
South Devon	Hereford	15	47	46	7	0	100	7
	Angus	33	39	58	3	0	100	12
	Average	48	42	54	4	0	100	10
Limousin	Hereford	37	14	75	8	3	100	8
	Angus	27	37	63	0	0	100	4
	Average	64	24	70	5	1	100	6
Simmental	Hereford	16	12	50	38	0	100	6
	Angus	17	53	35	12	0	100	12
	Average	33	33	43	24	0	100	9
Charolais	Hereford	21	29	52	14	5	100	14
	Angus	22	27	73	0	0	100	14
	Average	43	28	63	7	2	100	14
Average all sire breeds	Hereford	178	40	51	8	1	100	7
	Angus	237	62	37	1	0	100	8
	Average	415	52	43	4	1	100	8

[1] Preliminary data, U.S. Meat Animal Research Center, Clay Center, Nebr. [2] 1. Normal delivery; some calves may have been assisted but assistance may not have been required. 2. Major difficulty and calf puller was used. 3. Caesarean birth. 4. Posterior presentation.

Angus nowadays, the animals generally are inclined to shorter coupling, more compactness, and earlier maturity than most beef breeds. They became popular where grass was relatively abundant and the operator aimed to grass finish. But feeders looking for growth-gain discriminated against Angus feeder calves.

Charolais are gaining in popularity but as yet there are very few Charolais herds on Western ranges. The common crosses are from these 3 breeds. However, through the importation of semen from bulls of the Simmental, Limousin, Chianina, Murray Grey, and Welsh Black breeds, crosses from these animals are becoming popular. There would be more crosses from these breeds if more bulls or semen were available. Ranchers reported difficulty and disappointment in purchasing semen. Some bulls were so popular that a backlog of orders had been built up for their semen. As a result, ranchers had to reorder semen from less popular bulls. This caused delays in breeding and ranchers felt they were purchasing semen from second and third choice sires.

To date there are no herds of these exotic animals in the United States. Some of them will become popular after the opening of the U.S. quarantine station at Fleming Key, Fla., in 1974. Until then these animals will be introduced into the United States via imported semen.

More light will be shed on advantages and problems in crossbreeding as females of these breeds become available. Many of these females are excellent milkers and good mothers and will provide excellent stock for straightbred and crossbreeding programs.

Calving Rate and Death Loss

Most cattle in this study area graze under rigorous conditions. Range feed is sparse, requiring around 27 acres to carry a cow. Range feed conditions vary considerably from season to season and have some effect on calving rate.[4] But, unless there is a protracted or sustained drought, the animals on these ranches maintain a fairly high calving rate, probably the second-highest rate among major U.S. cattle-raising areas (fig. 8).

Despite its sparseness, the range feed is nutritious. Due to this fact and the high quality of the breeding stock, the fertility rate of the animals is relatively high. In more than a decade the calving rate (number of calves branded and marked per 100 brood cows and heifers in the breeding herd) had remained above 90, with a slight uptrend in recent years.

[4] The correlation coefficient is 0.475, and the regression coefficient is 0.05447.

Table 7.–U.S. Meat Animal Research Center: Calving score of 3, 4 and 5 year old cows by breed, 1970 calf crop[1]

Breed of sire	Breed of dam	Calves	Calving difficulty score[2]					Dead at or shortly after birth
			1	2	3	4	Total	
		Number	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Hereford	Hereford	37	95	3	0	2	100	5
Angus	Angus	32	94	6	0	0	100	6
	Average	69	94	4	0	2	100	6
Angus	Hereford	29	100	0	0	0	100	0
Hereford	Angus	47	98	2	0	0	100	0
	Average	76	99	1	0	0	100	0
Jersey	Hereford	29	97	3	0	0	100	3
	Angus	32	100	0	0	0	100	0
	Average	61	98	2	0	0	100	2
South Devon	Hereford	17	76	24	0	0	100	6
	Angus	12	100	0	0	0	100	0
	Average	29	86	14	0	0	100	3
Limousin	Hereford	44	89	9	0	2	100	4
	Angus	42	83	15	0	2	100	7
	Average	86	86	12	0	2	100	6
Simmental	Hereford	64	80	20	0	0	100	16
	Angus	72	85	14	0	1	100	6
	Average	136	82	17	0	1	100	10
Charolais	Hereford	64	77	20	0	3	100	12
	Angus	67	79	16	0	5	100	8
	Average	131	78	18	0	4	100	10
Average all sire breeds	Hereford	284	86	13	0	1	100	8
	Angus	304	88	10	0	2	100	5
	Average	588	87	11	0	2	100	6

See table 6, footnotes 1 and 2.

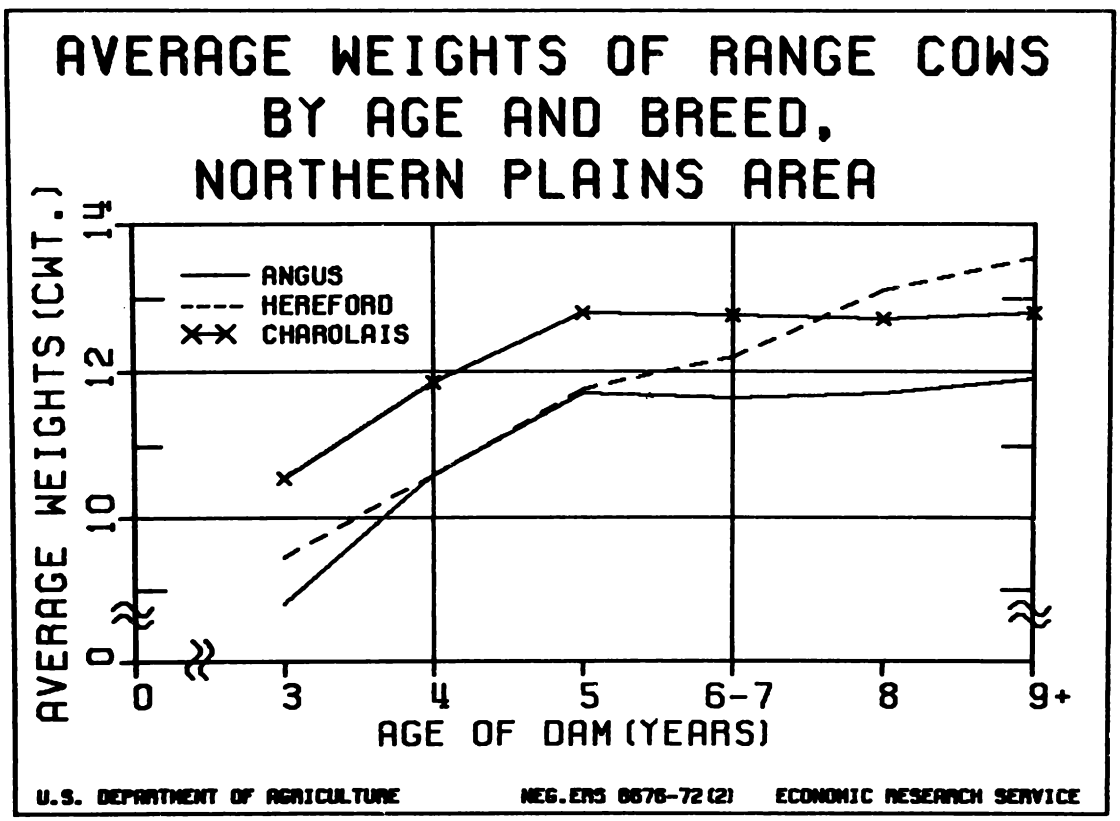


Figure 7

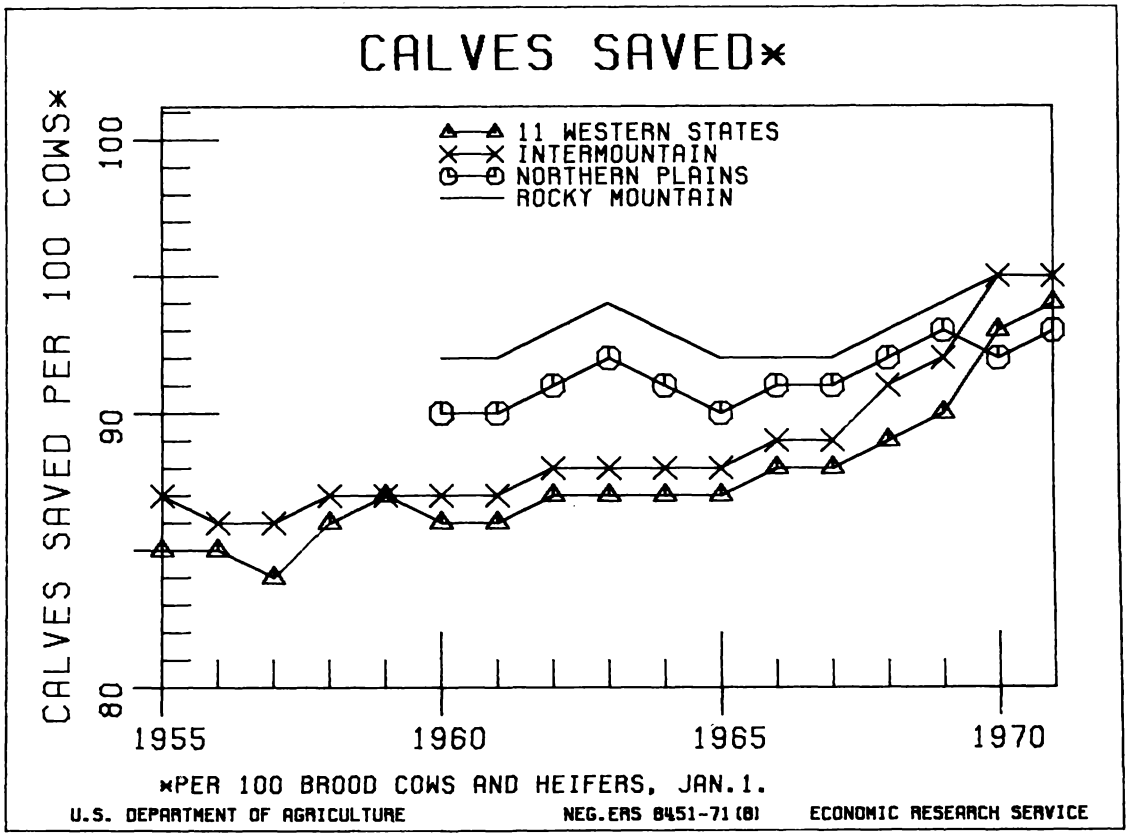


Figure 8

A high calving rate pays well; an increase of 3 calves marketed per 100 cows on these ranches means an extra profit of $1,000-1,500. Likewise, a net loss is incurred for every cow or heifer that fails to produce a calf.

Death loss of calves between branding time and marketing has varied widely from around 3.5 percent to 7.3 percent per year, averaging nearly 5 percent during 1960-71. For mature cattle, it has ranged from slightly less than 1.0 percent to 1.8 percent, averaging slightly over 1 percent. There has been no apparent trend in death loss of either calves or mature animals. The heaviest death loss of both calves and mature cattle occurred in 1965 when the breeding herd was almost record high. Coincidentally, calving rate was at its low in that year. Death loss of calves more than offset the effects of the large breeding herd, and calves marketed per 100 cows were a record low. Prices received for calves in 1965 were the second lowest in the 12-year study period. Thus, cash receipts from marketings were the fourth lowest on record.

Range Conditions

Range conditions vary widely from month to month and season to season in the study area. This is typical where rainfall is sparse and variable. Poor summer range conditions generally mean lightweight market calves.[5] Poor range conditions in the late fall mean heavy supplemental feeding. A flash growth of forage produces succulent feed, but such feed has little strength or nutritional value. Consequently, the animals do not put on sustained weight, although their general appearance is good.

Annual precipitation and range conditions vary considerably from year to year (fig. 9). There is a fairly close relationship between them, since range conditions improve with increased precipitation.[6] Annual precipitation increased and range conditions improved during 1960-71. In 1967-71, the index of range conditions averaged 106, (1960-64=100) while the index of annual precipitation averaged 109. Market weight of fall calves was nearly 8 percent higher in 1967-71 than in 1960-64, and net ranch production was up 18 percent.

Costs and Returns

Net Ranch Income

Net ranch income (returns to the operator and unpaid members of his family for their labor and management, and to total capital) averaged about $31,500 per ranch in 1971 (table 8). This was a record, up about $5,500 from a year earlier and 2½ times the 1960-64 average. Since 1964 net ranch income has moved up strongly

[5]The correlation coefficient of calf market weights and range conditions is 0.556, and the regression coefficient is 1.17593.

[6]The correlation coefficient is 0.897, and the regression coefficient is 2.91138.

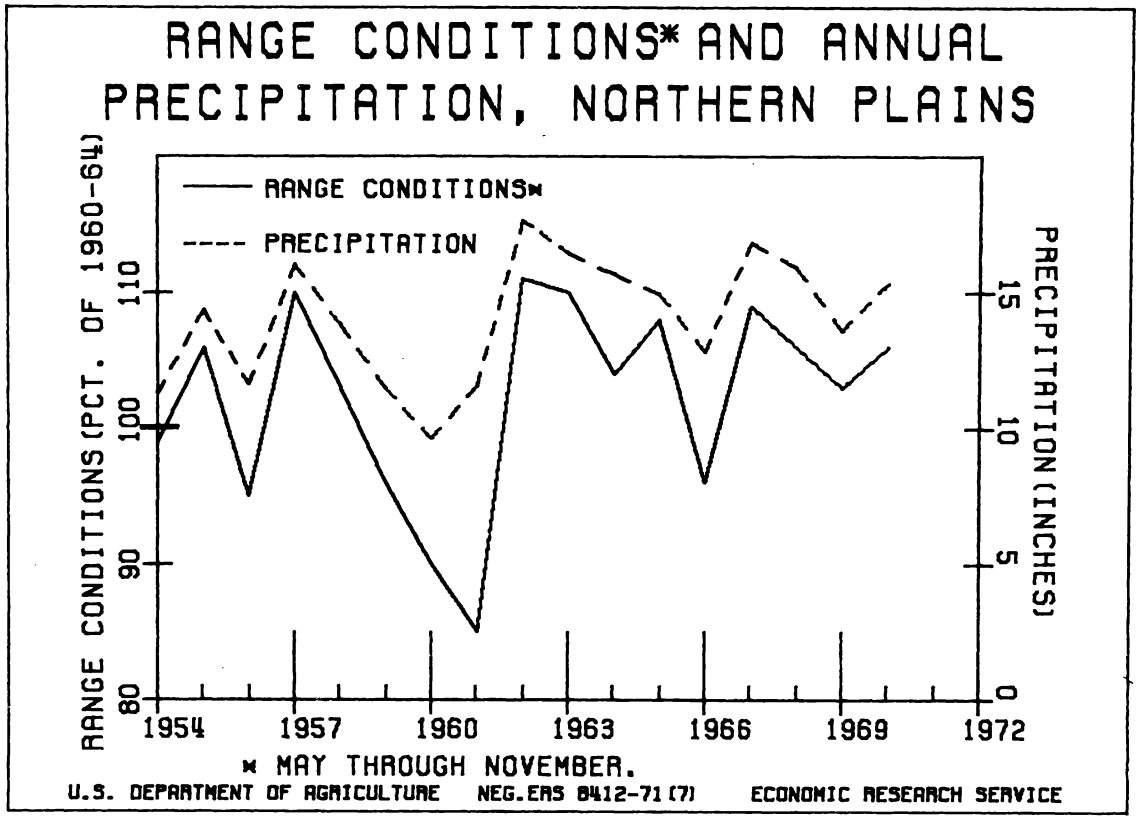


Figure 9

each year with year-to-year increases ranging from 9 to 43 percent.

Several factors contributed to these strong gains. Prices received for cattle, the most important single factor on these ranches, moved up each year since 1964. Prices in 1971 averaged 46 percent above the 1960-64 average. Prices received for early fall calves averaged about $26.00 per hundredweight in 1960-64. In 1971, they averaged $38.50, up by nearly half from the 1960-64 average. Prices received for late fall calves, steers and heifers, and cows moved up less strongly. All of the cash receipts on these ranches are from the cattle enterprise.

The ranch breeding herd averaged around 300 brood cows during 1960-71, and year-to-year changes ranged as high as 16 head between 1964 and 1965. However, herd size was maintained at a slightly higher level in the latter part of the period. During 1967-71, it averaged 308 head, 16 above the 1960-64 average, as better management and improved range forage and crop production permitted ranchers to carry larger herds.

The index of range forage conditions in the last 5 years averaged 6 percent above the 1960-64 average; forage condition indices remained above 100. Furthermore, range conditions were consistently good, remaining above 100 with year-to-year changes of not more than 3 percentage points during the last 5 years. This was important in expanding or maintaining breeding herds and stocking ranges. A few consecutive drought years such as 1960-61 can raise havoc with a breeding herd. In 1960-61, the breeding herd averaged slightly over 295 head, but because of the drought and relatively low cattle prices, ranchers reduced their breeding herds in 1962 and 1963, just as range forage conditions reached a 1960-71 record high. At the conclusion of these 2 lush range years, ranchers began to expand, and the breeding herd reached 310 head in 1965.

Low hay production magnified the problem in 1960-62. Hay yields in those years were lowest in the study period. Total hay acreage per ranch was near current record levels but production averaged only 118 tons per ranch, about half of normal production. Production in 1963-64 was up by more than four-fifths. Hay production in this area, like range forage output, depends on precipitation. Hay production per ranch in the last 5 years averaged about 230 tons per ranch, up 70 tons from the 1960-64 average.

Because of generally better range forage and feed conditions in recent years, livestock came through in better condition. Calving rates in 1967-71 were up slightly from 1960-64, cattle death losses were down 17 percent, and cattle and calves were marketed at heavier weights. In 1967-71, fall market calves averaged about 420 pounds per head, up about 30 pounds from 1960-64, and because of a slightly larger breeding herd and higher calving rate, more calves were produced in recent years. Marketings of other cattle also increased. Net ranch production in 1967-71 was up a fifth from the 1960-64 average, and in 1971 was a record, up a third from the early 1960's.

Table 8.—Northern Plains cattle ranches: Costs and returns per ranch, 1960-71[1]

Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Livestock on ranch:												
All cattle	432	437	424	429	439	463	461	458	470	468	468	487
Brood cows and heifers	294	297	288	287	294	310	300	311	306	309	303	311
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Total ranch capital, Jan. 1	277,410	279,520	287,570	307,220	314,710	327,540	351,680	389,460	406,090	429,160	448,710	461,210
Land and buildings	194,880	200,200	205,180	210,160	227,360	249,880	259,840	295,600	306,580	324,800	333,400	337,520
Livestock	65,380	62,570	65,920	77,860	68,010	57,380	70,100	72,830	75,740	80,510	90,330	96,990
Machinery and equipment	14,260	14,480	14,920	15,120	15,420	15,990	16,680	17,560	18,400	19,120	20,060	21,280
Crops	2,890	2,270	1,550	4,080	3,920	4,290	5,060	3,470	5,370	4,730	4,920	5,420
Total cash receipts	29,695	31,907	34,516	30,208	24,756	30,491	35,075	36,048	39,102	44,362	44,800	52,857
Calves	15,726	16,564	18,136	15,700	12,483	14,047	17,928	17,698	19,374	21,883	22,277	26,172
Steers and heifers	7,370	8,272	8,509	7,628	6,109	9,130	8,942	9,939	11,094	12,668	12,484	15,470
Cows and bulls	6,599	7,071	7,871	6,880	6,164	7,314	8,205	8,411	8,634	9,811	10,039	11,215
Value of perquisites	968	981	991	964	933	960	1,015	1,020	1,059	1,126	1,154	1,181
Change in inventory:												
Livestock	580	-1,790	410	1,560	2,720	-1,090	520	980	-110	-375	3,080	1,215
Crops	-559	-756	2,850	-183	-902	1,157	-2,498	2,399	-431	-249	740	645
Gross ranch income	30,684	30,342	38,767	32,549	27,507	31,518	34,112	40,447	39,620	44,864	49,774	55,898
Total operating expenses	19,395	20,574	22,360	17,439	17,564	20,719	18,617	23,618	20,832	22,260	23,729	24,361
Feed and grazing fees	4,097	5,225	6,691	1,192	1,284	3,779	1,330	4,885	1,416	1,879	2,088	1,614
Other livestock expense	2,150	2,232	2,166	2,164	2,196	2,202	2,179	2,207	2,299	2,415	2,520	2,678
Crop expense	394	307	423	473	416	443	415	513	555	547	570	539
Machinery expense	4,476	4,477	4,559	4,653	4,711	4,886	5,026	5,335	5,578	5,839	6,170	6,555
Buildings and fences	1,435	1,455	1,465	1,495	1,510	1,520	1,555	1,615	1,675	1,755	1,805	1,870
Property taxes	2,186	2,168	2,278	2,537	2,443	2,702	2,622	3,223	3,155	3,290	3,520	3,727
Hired labor	4,080	4,120	4,180	4,292	4,348	4,516	4,776	5,088	5,364	5,692	6,160	6,416
Other expense	577	590	598	633	656	671	714	752	790	843	896	962
Return to operator labor and management and total capital	11,289	9,768	16,407	15,110	9,943	10,799	15,495	16,829	18,788	22,604	26,045	31,537

[1] Preliminary.

Cash Receipts

Record cash receipts from livestock marketings averaged nearly $53,000 per ranch in 1971, up about $8,000 from a year earlier and up nearly $23,000 from the 1960-64 average. Receipts from sale of feeder calves made up half of the 1971 total receipts. This proportion has diminished since the early 1960's as yearling programs have become more important on these ranches.

Prices Paid

During the 12-year study period, ranchers faced higher and higher prices for production inputs. Prices paid for items and services used in production increased year by year and in 1971 averaged nearly two-fifths above the 1960-64 average. Good management and increased production efficiency lessened the impact of these higher prices. Total operating costs increased by a fourth between the early 1960's and 1971. Changes during the period ranged from a decrease of 56 percent for feed to increases of 60 percent for property taxes. Outlays for hired labor and machinery operation and replacement have been the largest expense items in recent years. They were exceeded by feed purchases in 1960, 1961, and 1962 when droughts reduced forage production and ranchers were forced to purchase more feed.

Production Efficiency

Although prices paid for production inputs rose sharply and total operating expenses per ranch mounted to record highs, ranchers more than offset these handicaps by more efficiency in production. As a consequence of consistently better range forage conditions in recent years, improved management, larger breeding herds, and more crossbreeding, production efficiency has gone up. Net physical output per unit of input has remained above 100 percent of 1960-64 for the last 6 years and in 1971 was nearly a fourth above the 1960-64 average. During the last 5 years, it averaged nearly a sixth above the early 1960's (table 9).

Ranch Capital

Owning a viable cattle ranch today is big business. Total ranch capital in a typical Northern Plains cattle ranch approached a half-million dollars in 1971, having increased by two-thirds since 1960. Increases were manifest in each year. Nearly three-fourths of the ranch assests are in real estate, and most of this is in grazing land. Per acre values of grazing land moved up continually to average around $37 in 1971, up from around $21 in 1960. Per acre values of improved land (cropland, prairie land, and improved pasture) increased in most years, and went up about the same proportion as grazing land.

Investment in machinery and equipment advanced each year as ranchers paid higher prices to replace equipment, in some instances with larger units. Machinery and equipment assets averaged around $21,000 per ranch in 1971, up by nearly half from 1960. It must be noted that this equipment has been used considerably and therefore these values are equivalent to around 50-60 percent of the cost of new machinery and equipment. Cattle ranches are not highly mechanized. The equipment typically consists of 2 or 3 older tractors, some haying and tillage equipment, 2 or 3 pickups, a heavier truck, some trailers, and miscellaneous items. Livestock sold is generally contracted to be picked up at the farm and trucked at the buyer's expense.

Inventory value of livestock approached $100,000 per ranch in 1971, up nearly $6,700 from a year earlier and $32,000 from 1960. Brood cows averaged close to $275 per head in 1971 and 18-month-old replacement heifers were inventoried at around $200 per head, up nearly 50 percent from 1960. Assets in livestock comprised a little over a fifth of total ranch capital in 1971, slightly lower than in the early 1960's when land values were not as high.

Investment per Brood Cow

Many people think of the West as vast areas of rough, open, unfertile, and inexpensive land, and that the big investment in cattle ranching is in cattle. This is far from actuality (fig. 10). Less than a fourth of the ranchers' assets are in cattle, and much of the land is not rough and unfertile. Its chief drawback is water shortage or lack of precipitation. Although the average land value per acre may appear low it is not cheap when one realizes that

Table 9.—Northern Plains cattle ranches: Production, costs, and prices, 1960-71[1]

Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	1960-64=100											
Net ranch production	98	85	102	108	107	102	105	114	118	118	123	132
Range conditions	90	85	111	110	104	108	96	109	106	103	106	108
Production per unit of input	98	88	104	106	104	100	101	110	112	112	117	124
Operating expenses per unit of production	101	115	104	89	91	105	99	106	99	105	106	104
Total cost per unit of production	98	109	96	97	100	107	112	113	116	123	128	125
Prices received for products sold	96	103	112	101	88	96	110	111	114	127	136	146
Prices paid, including wages to hired labor	98	98	101	101	102	105	107	114	118	123	129	137

[1] Preliminary.

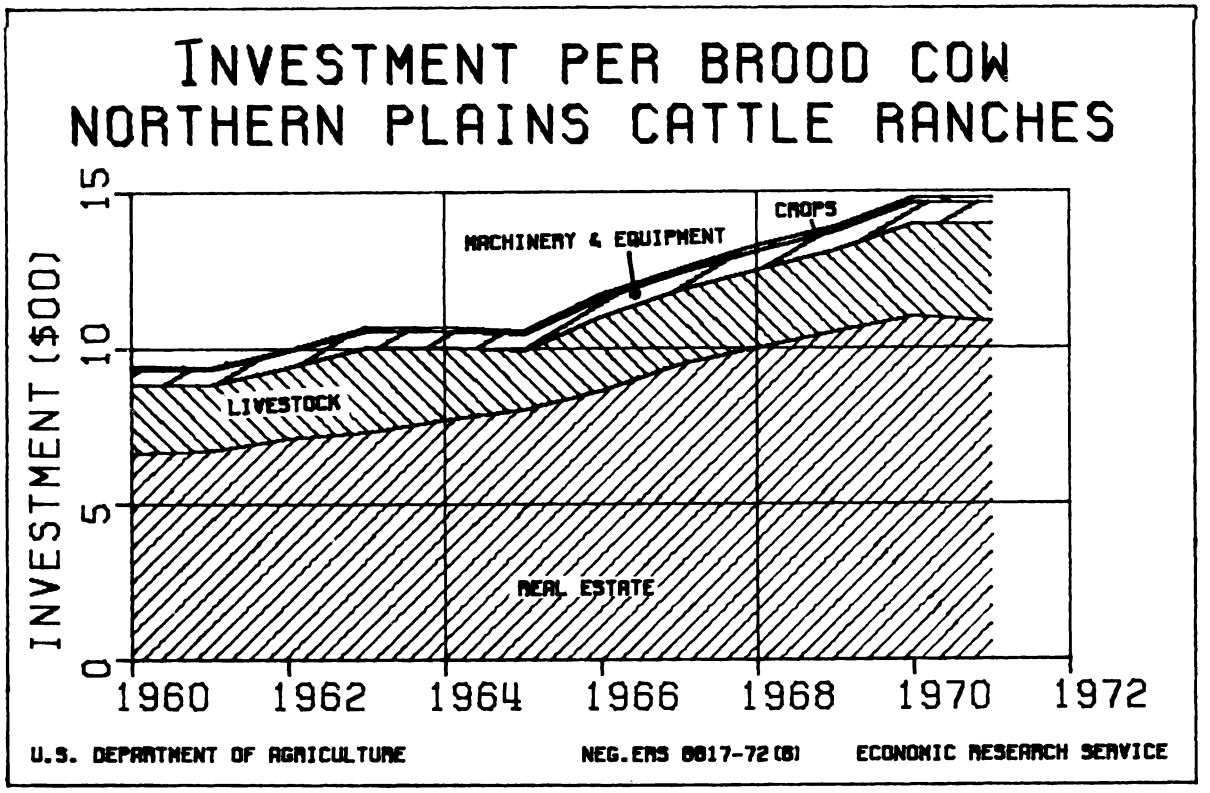


Figure 10

around 30 acres of range land are required to carry a cow and her calf.

In 1969-71, investment in land and buildings, including reservoirs, water tanks, wells, fences, and related livestock equipment, averaged close to $1,100 per cow on Northern Plains cattle ranches. Land appreciation carried this value up 60 percent from the early 1960's. With no open public range available and few streams to provide stock water, operators must provide water and own and fence more land than would be required if public land were available. Total investment per cow, including land and improvements, machinery and equipment, and stock replacements, was close to $1,500 in 1971, up $500 from the early 1960's.

Ownership

Almost all Northern Plains cattle ranches, like other Western livestock ranches, are owner operated. The typical operator is a specialist, generally proficient in the cattle ranching business, who grew up with the family enterprise. He is around 51 years old, younger than livestock ranchers in some Western areas, but older than many Western crop farmers and farmers in the Midwest and South.

The operator needs considerable capital and time to build up a livestock breeding enterprise. He must have an economic-sized herd if he is to survive in the ranching business. Investment in livestock, machinery, and equipment for such an operation approaches $120,000 per ranch.

An operator with this kind of an operating unit would have great apprehension about his economic future if he depended mostly or totally on rented land. If he were unable to lease sufficient land, he would have to reduce his herd below an economic-sized unit, and possibly sell part of his herd at a sacrifice. If the unit of land available for rent were too large for his enterprise, he would have feed going to waste or he would have to add to his herd. A rental unit for his herd would seldom provide a balance between livestock, grazing land, and cropland to produce winter feed.

Indebtedness

According to surveys in 1970 and 1971, nearly all ranchers carried debts. Those without a real estate mortgage had operating loans, and vice versa. In 1971, real estate debt averaged around $72,000 per ranch, or about $230 per brood cow, a little lower than a year earlier. Chattels or operating loans averaged about $45,000 per ranch, about $145 per brood animal, more than the year before. Lenders consider loans of this size well within the limits of a good credit operation.

There was a great range in real estate debt per ranch. Some loans were almost at maturity, while others were more recent and naturally were much larger and bore higher rates of interest. Interest rates varied with the age

and source of loan. Some real estate mortgages were held by close relatives and were usually at lower rates of interest. The common rate paid in 1971 was 5.8 percent, up slightly from a year earlier.

There was also a considerable range in size of operating loans. But because these loans are of intermediate term, usually a year or less with many renewed each year, interest rates varied little. The common rate on 1971 loans was 7.7 percent, well below a year earlier in line with the trend in interest rates. (See later discussion on indebtedness on Northern Rocky Mountain cattle ranches).

Operator Returns

Interest paid in 1971 on ranch debt amounted to $7,641 per ranch ($72,000 real estate mortgage x.058 + $45,000 operating credit x.077). After deducting interest paid from net ranch income (return to operator labor and management and total capital), the return to operator labor and management and equity capital amounted to about $23,900 (table 10).

Table 10.—Northern Plains cattle ranches: Returns to resources per ranch, 1971

Item	Unit	1971
Net ranch income	Dollar	31,537
Interest paid on mortgages[1]	do.	7,641
Income available for family living	do.	23,896
Charge for operator's services[2]	do.	5,300
Return to operator's equity capital	do.	18,596
Total ranch capital	do.	461,210
Operator's equity capital	do.	344,210
Return on total capital	Percent	5.7
Return on operator's equity capital	do.	5.4

[1] Real estate mortgage of $72,000 at 5.8 percent and operating loans of $45,000 at 7.7 percent. [2] Annual wage to a full-time hired hand x 1.25 plus perquisites.

Three questions are often asked: "What return does the operator of a viable cow-calf operation receive on his equity capital?" "What investment return does a viable cow-calf operation provide all equity holders?" "Would an operator or an investor make a greater return if his capital were invested in some other venture?" A glance at table 10 provides a partial answer to these questions.

Assuming a nominal charge of $5,300 for operator's labor and management, including living quarters and ranch-produced perquisites, the return on total ranch capital was 5.7 percent in 1971. This was a record return, up from 4.7 percent a year earlier and 3.5 percent for 1960-71. The 12-year average for these ranches was well below that for Rocky Mountain cattle ranches and Utah-Nevada migratory-sheep ranches, where less private land is required because of the extensive use of public grazing land. The return was far above that for Southwest cattle ranches where the carrying capacity of grazing land is relatively low, the land investment per animal unit is high, and there is little use of public grazing land.

Returns to operator's equity capital were lower than returns to total ranch capital because rates charged on borrowed money were higher than the rate of return earned by the operation. Return to operator's equity and also to total capital in 1971 was well above the composite return of 3.37 percent on common stocks.

Capital appreciation has long been considered a very important element in a business venture. In some years it has exceeded net operating returns, and has been a big factor in keeping some farmers and ranchers in business. Although net operating returns have stood up well on Northern Plains cattle ranches, capital appreciation has added much to the economic wellbeing of the operators.

During 1960-71, net asset appreciation on the typical Northern Plains cattle ranch amounted to $177,000, approximately $14,750 per year. This was considerably more then on Rocky Mountain cattle ranches and partly accounted for the lower rate of return on capital on Northern Plains cattle ranches. In estimating net capital appreciation, each addition to ranch assets was charged against the closing inventory at a value or price paid for the respective asset in the year it was added. Likewise, each item sold was credited to the year-end inventory in the year it was sold. Thus ranch capital appreciation was due to price change and not to change in physical quantity.

NORTHERN ROCKY MOUNTAIN AREA

The area studied is confined mostly to 12 counties in southwestern Montana and 7 counties in east-central Idaho (fig. 3). However, cattle ranches in a much larger area are represented since there are many similar ranches beyond the borders of these counties. The study area is the most important cow-calf producing area in the Rocky Mountains and has a large concentration of cattle. It has about a fifth as much farmland as the Northern Plains area but nearly half as many brood animals (table 1). It has a substantially higher ratio of brood cows per acre of farmland than the Intermountain States or the Western States. However, there is a large acreage of public land in the Northern Rocky Mountain area. Nearly 19 million acres or almost two-thirds of the total land area is administered by the Forest Service, U.S. Department of Agriculture, and the BLM.

The ratio of total land area to land in farms is almost 3 times that of the Northern Plains and nearly two-fifths higher than in the 11 Western States. Use of publicly administered lands is very important to Rocky Mountain cattle ranchers. Nearly all of their summer grazing is on these lands.

Extensive use of public grazing land and heavy winter feeding done by Northern Rocky Mountain ranchers are

striking differences that distinguish ranching in the Northern Rocky Mountains from methods in the Northern Plains. The use of public land makes available very good summer range at reasonable costs, and thus reduces investment in grazing land. Real estate investment for a 300-cow unit in the Rocky Mountain area is about two-thirds that in the Northern Plains area.

A cow and her suckling calf can graze the public domain for the same fee as an animal 6 months old or older, which gives the advantage to cow-calf operations. Rocky Mountain ranchers thus carry fewer yearlings than Northern Plains ranchers and carry about 12 percent fewer cattle in inventory with the same size breeding herd. However, many Rocky Mountain cattle ranchers are buying up private land as it becomes available and are increasing their yearling herds. Although the livestock inventory on Rocky Mountain cattle ranches is smaller than on Northern Plains cattle ranches, cash outlays for feed and grazing are much higher because of heavy winter feeding and expenditures for grazing public lands.

Rocky Mountain cattle ranchers winter feed about 5 months and graze public lands 3-4 months. In this mountainous area with small plateaus and valleys, there is little land for growing hay. Ranchers often buy hay to carry their stock through the winter. Thus, they depend much on valley farmers for feed supplies. Because of the heavy snowpack, cattle are fed in the valleys near the ranch quarters and feed supply.

Physical Characteristics

Topography

This 30-million-acre area is characterized mostly by ranges of high mountains, relatively high plateaus, and numerous small valleys. Three major rivers, the Salmon, Beaverhead, and Madison, and their numerous tributaries penetrate this area, creating a rugged physical profile. Mountains jut up to 12,000 feet in elevation. The higher portions of the Rocky Mountains, the Bitterroot, and the Sawtooth ranges are rugged, abrupt, and rocky; consequently no grazing is done at these elevations. However, they are important retainers of snow and moisture essential for summer needs. Summer grazing is generally very good at the lower elevations and foothills. The plateaus are relatively high and also provide good summer grazing. Mountains and plateaus comprise much of the public land.

The valleys lie between 4,000 and 6,000 feet above sea level. Valleys range from less than a mile to several miles in length and width.

Precipitation

Precipitation in this area is highly variable, as might be expected with such tremendous changes in elevation. The lowest annual precipitation recorded from 1930 through 1970 at the official weather stations was a little over 4 inches and the highest approached 20 inches. Precipitation in some of the higher elevations, where no regular official readings are made, far exceeds 20 inches. Snowpacks vary considerably at these elevations, measuring several feet. Snow begins early in the fall and generally remains until late spring and early summer. Livestock must be moved to the lower elevations in early fall to avoid heavy losses in both numbers and weights of animals.

The average annual precipitation for 1931-60 was 9.44 inches, almost a third less than in the Northern Plains area. This average, however, applies to official stations located at lower elevations. Monthly precipitation ranged from 0.62 inch in August to 1.27 inches in June (fig. 11). This variation is far less than for the Northern Plains area. Precipitation in the Rocky Mountain area averages higher during the winter months than during the critical grazing months of July, August, and September, the influence of heavy snows. Winter precipitation is critical for irrigation storage water, supplying a reserve for summer grazing. Heaviest summer precipitation also comes at the high elevations. Most of the summer grazing is on plateaus and valley slopes at moderately high elevations. Range forage at some of these locations is excellent.

Temperatures

Most days have full sun. Light fleecy clouds, fast moving and carrying little moisture, are common in the spring and occasionally at mid-morning in other seasons. Afternoons are generally clear. Humidity is relatively low, generally between 30 and 50 percent, and rarely reaches the 70's. On warm afternoons humidity readings are 15-35 percent, a very comfortable range.

Light breezes make summer days comfortable and refreshing, even at 100 degrees. Nights are cool and pleasant in summertime with lows of 40-50 degrees. A 24-hour temperature range of around 50 degrees is not uncommon. In late fall, winter, and early spring pleasant days with temperatures around 60 degrees are common, but night temperatures often drop below freezing. During the December-April winter feeding season snow squalls are common. Temperatures stay well below freezing for days at a time, pushing up feed requirements and making feeding and management of livestock unpleasant.

Many localities are protected by hills and mountain ranges, and thus spared the cold waves that often penetrate the Northern Plains for days and weeks at a time. Cold snaps in these protected areas are often followed by southwest "Chinook" winds, bringing the temperature up to the 50-degree range within a few hours. Very strong winds seldom penetrate these areas.

Growing Season

Relatively high altitudes and the 44-47 degree latitude make the average growing season comparatively short, although great differences in altitude create a wide range in length of growing season. The frost-free period in the

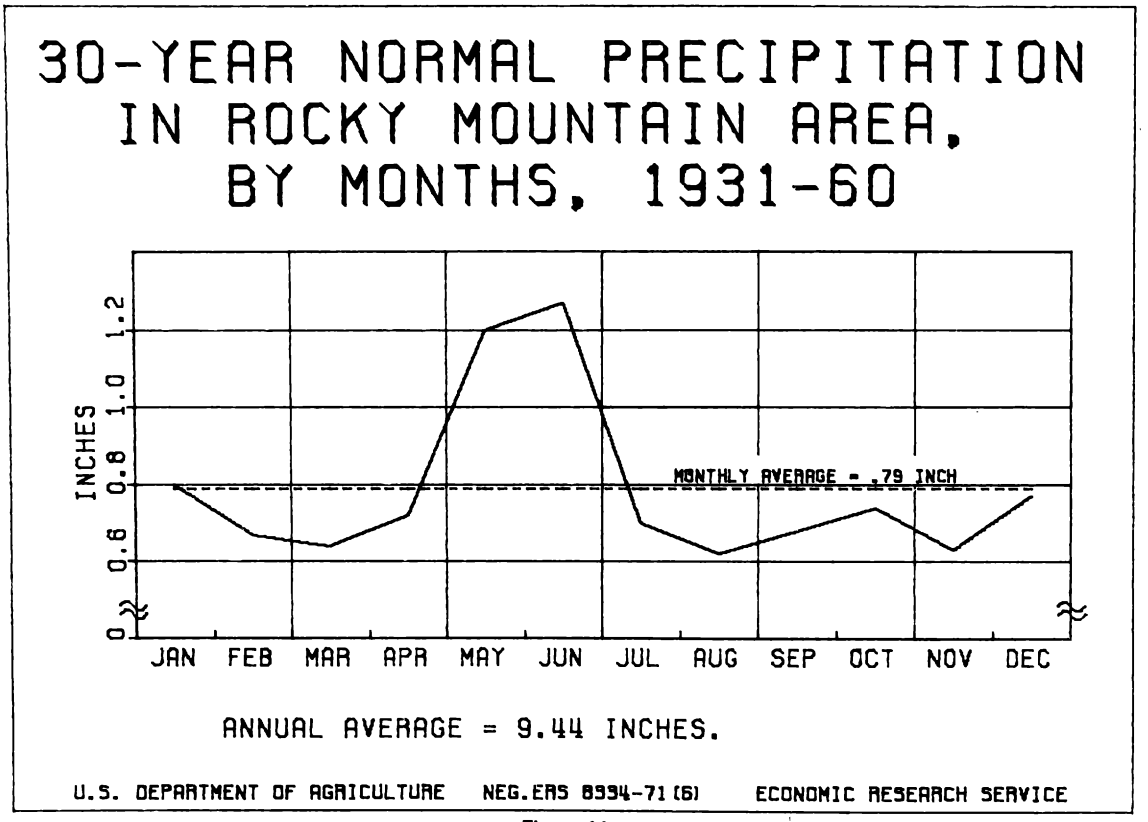


Figure 11

study varies from as little as 4 days up to 150 days, but averages 110 days in the cropping area.

Hay and grains are the major crops. Hay production is nearly 5 times more valuable than wheat, the second-valued crop. All of the hay is grown in valleys, and 2 crops of alfalfa or mixed hay are usually grown. One cutting a year is also made from a fairly large acreage of native hay. Yields are relatively light, but the hay is relatively high in nutritive value. Livestock ranchers grow little grain and most of this is for a nurse crop for new hay-seedings. It is not uncommon for the grain crop to get frostbitten, reducing the yield and quality.

Range output varies greatly but is highly productive in some areas. The short grasses, including the grama grasses, wheat grasses, fescues, needle grasses, and June grass and associated species, do quite well. Sagebrush species are common throughout the area, and often reduce growth of grasses.

Soils

The soils in this area are as varied and complex as the geological formations from which they were derived. In the rough, mountainous portion of the area many forms of igneous, metamorphic, and sedimentary rocks are visible, twisted and eroded into varied shapes and forms.

Soils in the foothill sections generally consist of assorted stones, gravel, sand, silt, and clay. These soils are generally fairly deep and have good water storage capacity, helping to stabilize the continuous water flow. Soils in the mountain meadows and bottom lands are alluvial deposits and outwashes from soils in the adjacent uplands. As might be expected, these soils vary greatly in texture and depth and are mixtures of stone, gravel, silt, and clay. They also vary greatly in water requirements and productiveness.

Economic Characteristics

Around a third of the total land in this area is in farms. This ratio is far below the nine-tenths in farms for the Northern Plains area, and around half that for the United States or the 11 Western States. There are nearly a dozen national forests in this area and large tracts of land administered by the BLM. Thus, large acreages of public grazing land are available to livestock operators. In addition to these grazing lands, many ranchers also operate a section or 2 of State land. Some State lands are fenced and operated jointly with the rancher's private range. Most of the land administered by the Forest Service and much of the BLM land is open grazing.

There are no fast roads in the area except for Interstate 90, which virtually forms the northern boundary of the area. All other roads run north and south. These are mostly auxilliary highways and farm-to-market roads winding along the rivers and valley floors. The streams are not navigable-they are small,

circuitous, and have many rapids. There is a small branch railroad running through the middle of the area connecting the main lines at Pocatello, Idaho with Butte, Montana.

There are no major manufacturing, fabricating, or assembling plants. Livestock, lumber, and minerals, the major products exported from the immediate area, are mostly shipped eastward. There are a number of relatively small feedlots, but the bulk of feeder calves go to Midwestern feedlots. Some feeder stock is sold on contract, but the majority is sold direct to feeder-agents.

There are 2 major national parks, Yellowstone and Glacier, and a number of smaller but popular resorts and tourist attractions. Fishing, hunting, boating, skiing and snowmobiling are popular, and tourist traffic during the summer and big game hunting seasons in the fall is relatively heavy.

Population

The study area is sparsely populated, with approximately 117 acres of private and public land per person, well below the 144 acres per person in the Northern Plains area. In terms of private farmland, however, the Rocky Mountain area has about 40 acres per person compared with almost 130 acres per person in the Northern Plains, where there is very little public land. Total 1970 population was only 257,000, and highly rural. This was only a fifth more than in 1940 and represented much less growth than for any of the Western States. The 1970 population in the Western States was almost 2½ times the 1940 level.

Only 6 of the 19 counties had more than 10,000 inhabitants. Nearly half of the counties had no cities with over 1,000 inhabitants. Only 2 counties had as much as half of their population in cities with 1,000 or more population. There are only 2 cities in the Rocky Mountain study area with a population in excess of 10,000, Butte and Missoula, Mont.

The pattern of life and agriculture in the study area is similar to the Intermountain Region, where there are numerous small, autonomous communities. Relatively small farms and fields dot the lower valleys. These are mostly irrigated farms with a variety of small crop and livestock enterprises which supply feed and herd sires for the larger livestock ranchers. Many operators of these smaller irrigated farms live in the community, but nearly all of the cattle ranchers live on the ranch.

Importance of Cattle Production

About four-fifths of the farms in the Northern Rocky Mountain study area have brood cows. This is slightly below the percentage in the Northern Plains, but considerably greater than for the United States (table 2). More than three-fifths of the farms are classified as livestock ranches or farms and ranches with considerable beef cattle. There are many dairy, poultry, and crop-specialty farms in the numerous small valleys. Grain farms are common along the bench lands and some of the higher plateaus.

More than half the cattle produced in the area come from bonafide commercial cattle ranches, those with more than 200 head of brood animals. Nationally, units with 200 head or more provide nearly a fifth of U.S. cattle production.

Beef cattle production in this area has increased rapidly during the last few decades. There were 2½ times as many brood animals in 1970 as in 1940, showing a greater percentage increase than for any major Western area (fig. 5).

This 19-county area has less than 3 percent of the land area, including public land, in the 11 Western States but has more than 5 percent of the cattle. The percentage of farms classified as livestock ranches and units highly oriented to beef cattle production in the study area is almost double that for the 11 Western States. As stated earlier, this area produces more beef cattle than either Nevada, Utah, or Arizona.

Ranches Studied

The ranches studied in the Northern Rocky Mountain area are viable commercial cow-calf units with around 300 head of good quality Hereford or Angus brood cows. The rancher operates 9-10 sections of land, mostly grazing land, and holds permits to graze around 280 animal units on public land. He and his family manage the ranch and do most of the work. All of the ranch income is from the cattle enterprise with about three-fifths coming from the sale of fall feeder calves. Units of this type and size account for a third of the cattle and calves produced in the area.

Ranch Organization

Land Base

Of the total of 5,900 acres operated, nearly 94 percent is grazing land. Nearly all of this is extensively grazed, and 25-30 acres are required to carry a mature animal (table 11). Cropland is devoted exclusively to the

Table 11.—Northern Rocky Mountain cattle ranches: Land use per typical ranch studied, 1971[1]

Item	Acres	Item	Acres
Total land operated ..	5,900	Cropland harvested ..	354
Grazing land	5,300	Small grain	20
Owned	3,400	Alfalfa hay	102
Rented:		Mixed hay	232
Private	620	Other land:	
State and Federal	1,280	Cropland not harvested	11
		Improved pasture ..	220
		Farmstead and Other	15

[1] Preliminary.

production of hay and a small feed grain acreage used as a nurse crop for newly seeded hay. The grain provides feed supplements for replacement stock and heifers carrying their first calf. Most of the seeded hay is lightly irrigated and generally yields about 2 tons per acre of good quality hay. Between 215 and 245 acres, depending on moisture conditions, produce a crop of native hay. Per-acre yields range from 4/5 to 1-1/4 tons of good quality hay.

Total hay production per ranch varied from 350 to 500 tons during 1960-71. Since ranchers feed 5 months, a relatively long period, and around 1-1/2 tons of hay are required to carry an animal during a normal feeding season, hay must occasionally be purchased.

All of the cropland and most of the grazing land is operator owned. Nearly a section of grazing land is rented from private individuals and 2 sections of State and Federal land are rented. This land is usually isolated from other public land but contiguous to the rancher's holdings. Because of this the rancher generally has a long-term lease and operates and manages it jointly with his own land. Rental is paid on an AUM basis, with the rate geared to carrying capacity.

If it were not for accessible public grazing land, ranchers would need much more private grazing land to carry their stock. Nearly all brood cows and their suckling calves graze the summer on public lands on a permit basis. However, public ranges tend to be less productive. They typically consist of more mountainous forested and scenic land. Private holdings typically are more open and better situated for pasturing.

The Cattle Enterprise

The size of the cattle enterprise ranged from around 360 animals per ranch in 1960 to a record of 435 head on January 1, 1972 (table 12). About three-fourths of these are brood cows, a higher ratio than in most areas. Generally few yearlings are kept, but the number is increasing.

Although many Western cow-calf operators like to carry a few steer calves to the yearling age to take advantage of occasional lush range forage and good cattle prices, Rocky Mountain ranchers encounter 2 major problems in a yearling program. One is the long winter feeding program and restricted feed supply. The second is that grazing permits are limited. Most of their summer grazing is on public range, and the grazing fee is the same for a weaned calf or yearling as for a cow and her suckling calf. Thus, nearly all yearlings are grazed on private range. However, through good range management these operators have been able to carry a few more animals and have increased their yearling herd as well as their breeding herd.

Brood cows are good-quality, mostly Hereford or Angus animals, and are bred to high-quality bulls to calve, hopefully, in March-May. About 95 percent of the brood animals calve each year. The calving rate has increased slightly over the years and probably is the highest of any major cattle ranching area.

Table 12.—Northern Rocky Mountain cattle ranches: Cattle per ranch, January 1, 1960-72

Year	Total cattle	Brood cows and heifers	Calves		Bulls
			Heifers	Steers	
	Number	*Number*	*Number*	*Number*	*Number*
1960	361	273	50	27	11
1961	362	273	52	26	11
1962	358	276	47	24	11
1963	364	282	51	20	11
1964	369	282	49	27	11
1965	380	285	51	33	11
1966	403	303	52	36	12
1967	406	303	56	35	12
1968	411	307	52	40	12
1969	411	307	60	32	12
1970	423	312	60	38	13
1971	431	315	62	41	13
1972[1]	435	315	64	43	13

[1] Preliminary.

Around 17 percent of the brood cows over 2 years of age are replaced each year. Heifers are bred to calve at 2 years of age. Generally they are carefully selected and bred and conditioned for calving. Young heifers have more problems than older cows in calving, so bulls, mostly young ones, are selected to breed them.

Relatively few brood cows are artificially inseminated, but the number is increasing rapidly. Almost no heifers are artificially inseminated. Most of the semen used in inseminating cows is imported, mostly from Canada, and is from bulls of another breed. Other than Hereford, Angus, and Charolais crosses, most crossbreeding is done with artificial insemination. Around 30-40 percent of first progeny in the study area are the result of crossbreeding. (See the earlier discussion on crossbreeding on Northern Plains cattle ranches).

The calves are high-quality feeder animals sold off the range around October at an average market weight of about 450 pounds. Calf market weights have increased in recent years. Most calves go to Midwestern feeders.

Ranch Production

Net ranch production (combined net physical output of all ranch products) has gone up a fourth since the early 1960's and was record high in 1971 (fig. 12). This upsurge has occurred despite no expansion in acreage per ranch, and reflects several factors. Among these were a 14-percent increase in number of brood cows and heifers, a small but significant increase in calves marked or branded per 100 brood cows, a small increase in market weight of calves, and increased crop production.

Ranchers in recent years have been able to carry more livestock on the same acreage. There is a high correlation between precipitation and range forage conditions (fig. 13).[7] Although range forage indices showed no great increase during the 12-year period, they

[7] The correlation coefficient is 0.728, and the regression coefficient is 1.14434.

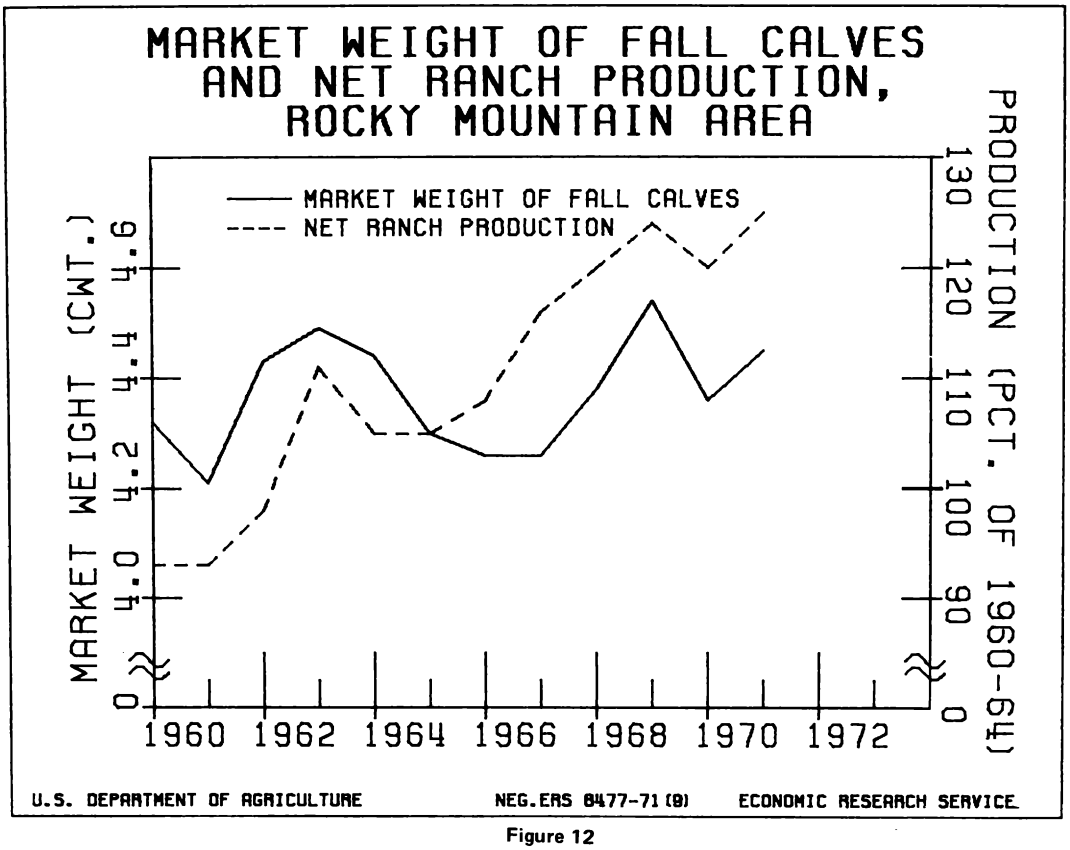


Figure 12

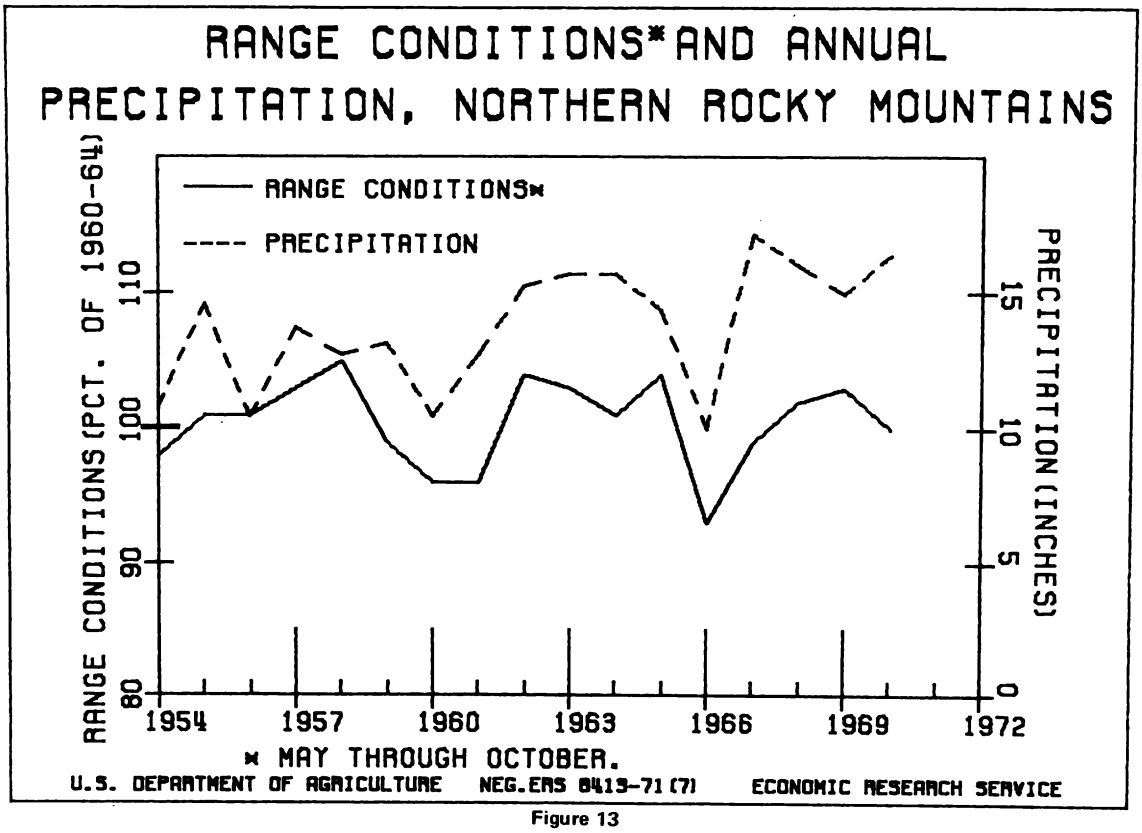


Figure 13

were consistently higher and showed less year-to-year variation during the last 5 years. (Little year-to-year variation is very beneficial in livestock ranching). Because of generally greater precipitation and a greater supply of water, range forage and crop production were improved. Higher calf prices in recent years may also have stimulated ranchers to utilize virtually the full capacity of their ranges. Also, through better selection and management of breeding stock, calving rates were improved and calf market weights were increased. Some of this increase was due to upgrading of the breeding herd and some was due to more crossbreeding and the use of bulls of the larger breeds. (See earlier discussion on crossbreeding). Total weight of beef produced per ranch increased by 15 percent from 1960-64 to 1968-71 to an average of 1,615 hundredweight annually.

Calving Rate and Death Loss

The calving rate on these ranches is probably the highest for any important cattle-raising area in the Nation. In the early 1960's, it averaged around 92 calves per 100 brood cows. Although it varied slightly from year to year, it moved up to near 95 percent over the last few years (fig. 8).

During the same period, death loss of cattle and of calves declined. In 1960-64, it averaged slightly over 1.3 percent for cattle and 5.8 percent for calves. In 1968-71, it averaged slightly under 1 percent for cattle and around 4.9 percent for calves.

Translated into net gain per ranch, the higher calf crop added nearly 10 calves. The lower death loss allowed approximately 3 more calves plus 1 more mature animal to go to market. Using 1971 weights and prices, this produced a net gain of almost $2,400 per ranch.

Improved management and breeding and better range forage were mostly responsible for the higher calving rate and lower death loss in recent years.[8]

Selection of better bulls, proper breeding, pregnancy testing, and careful observation of brood cows to cull nonbreeders are goals of alert ranchers. The increase in crossbreeding evident in the study area contributed to higher calving rates and lower death loss. Ranchers who crossbreed generally pay close attention to selection and breeding of stock, and crossbred animals have more vigor and viability than straightline animals.

Range Conditions

The range used by livestock on these ranches is in high country. Nearly all of the cows and their suckling calves are on public range at higher elevations during the summer. Output of forage is much more consistent throughout the grazing season and from year to year than for summer range at lower elevations and in the Northern Plains (figs. 9 and 13). During 1960-71, the range forage condition index for Rocky Mountain cattle ranches ranged from 93 to 104 percent of the 1960-64 average, while in the Northern Plains area it ranged from 85 to 111.

A few years of drought, which sometimes occurs in the Plains, can be very difficult on a breeding herd. Rocky Mountain ranchers have not encountered a sustained drought for the last dozen years, which partly accounts for the consistently higher calving rate. There has also been less year-to-year variation in death loss on Rocky Mountain cattle ranches.

Costs and Returns

Net Ranch Income

Net ranch income (returns to operator and unpaid family members for their labor and management, and to total ranch capital) averaged nearly $32,000 per ranch in 1971 (table 13). This was a record high, nearly a fifth above the previous high a year earlier and nearly 2½ times the 1960-64 average. Since 1964, net ranch income has moved up each year by 2-37 percent. The greatest percentage increase was from 1965 to 1966, when calf prices advanced $3.10 per hundredweight, net ranch production moved up 3 percentage points, and prices paid advanced only 1 percentage point. Four years of better than average range conditions preceded 1966. Ranchers took advantage of better range forage and began expanding their herd size. The greatest increase in total cattle (23 head per ranch) and cow numbers (18 head) was from 1965 to 1966. From 1961 to 1966, brood cow numbers per ranch increased by 30 head.

Production conditions and prices in 1971 were again very favorable. Calves at market time averaged a record $38.50 per hundredweight. Prices received for cattle and calves averaged a fourth above the 1960-64 average, and range forage conditions were about par, preceded by 3 good range years. Consequently, breeding herds were record large in 1971, calving rates were a record high, and calf market weights were well up, exceeded only by those in 1963 and 1969. Liveweight of cattle produced was nearly 5 percent above the previous record and a fifth more than in 1960-64.

Cash Receipts

Cash receipts per ranch averaged nearly $55,000 in 1971, a record and close to double the 1960 estimate. Most of this rise was due to higher cattle prices, but generally favorable range forage conditons made a considerable contribution, allowing for an increase in brood cow numbers per ranch, stepped-up calving rates, which were already at a high level, and higher calf market weights.

In the early 1960's, upwards of 65 percent of cash receipts on these ranches came from the sale of feeder calves. This proportion has generally decreased as ranchers have gradually held back more calves to be sold as yearlings. No doubt better range management of both private and public range and generally favorable precipitation, producing good growth of forage, have

[8] The correlation coefficient, range condition and calving rate, is 0.468 and the regression coefficient is 1.93360.

Table 13.—Northern Rocky Mountain cattle ranches: Costs and returns per ranch, 1960-71[1]

Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Livestock on ranch:												
All cattle	361	362	358	364	369	380	403	406	411	411	423	431
Brood cows and heifers	273	273	276	282	282	285	303	303	307	307	312	315
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Total ranch capital, Jan.1	215,030	218,480	234,100	251,420	253,260	266,800	288,180	292,150	297,950	311,680	337,650	344,060
Land and buildings	137,720	144,880	154,310	163,340	173,330	190,000	199,400	201,010	204,560	213,850	222,410	225,290
Livestock	55,280	52,480	57,600	66,320	57,420	50,780	63,530	64,500	65,080	70,000	85,990	88,680
Machinery and equipment	13,640	13,800	14,260	14,480	14,800	15,360	16,040	16,890	17,490	18,180	19,050	20,200
Crops	8,390	7,320	7,930	7,280	7,710	10,660	9,210	9,750	10,820	9,650	10,200	9,890
Total cash receipts	28,108	30,389	33,509	31,483	25,290	26,815	36,606	36,523	39,747	43,735	47,559	54,490
Calves	16,408	18,557	22,439	20,436	15,478	16,963	20,925	21,044	23,088	25,991	27,612	30,684
Steers and heifers	4,963	4,862	3,750	4,081	3,781	2,886	6,531	6,664	7,448	7,148	9,040	11,861
Cows and bulls	6,737	6,970	7,320	6,966	6,031	6,966	9,150	8,815	9,211	10,596	10,907	11,945
Value of perquisites	983	1,000	1,030	999	968	1,000	1,046	1,051	1,092	1,156	1,177	1,196
Change in inventory:												
Livestock	90	-200	1,425	415	1,180	3,690	285	700	120	1,900	1,375	640
Crops	-896	327	1,155	616	-272	141	-959	2,243	-866	-198	415	-267
Gross ranch income	28,285	31,516	37,119	33,513	27,166	31,646	36,978	40,517	40,093	46,593	50,526	56,059
Total operating expenses	18,168	19,155	20,291	17,353	17,183	18,575	19,064	22,088	19,206	20,139	23,601	24,227
Feed and grazing fees	4,350	5,292	6,191	2,550	2,381	3,429	3,313	5,363	1,819	1,902	4,047	3,546
Other livestock expense	2,105	2,181	2,125	2,139	2,169	2,145	2,172	2,172	2,302	2,395	2,546	2,707
Crop expense	760	648	756	823	862	873	864	994	1,084	1,089	1,160	1,181
Machinery expense	4,307	4,391	4,462	4,522	4,599	4,729	4,919	5,163	5,380	5,602	5,900	6,291
Buildings and fences	605	610	610	620	625	625	640	665	685	720	725	745
Property taxes	1,564	1,514	1,568	1,967	1,783	1,799	1,873	2,161	2,091	2,240	2,542	2,584
Hired labor	3,951	3,977	4,025	4,146	4,165	4,360	4,622	4,879	5,117	5,402	5,834	6,246
Other expense	526	542	554	586	599	615	661	691	728	789	847	927
Return to operator labor and management and total capital-	10,117	12,361	16,828	16,160	9,983	13,071	17,914	18,429	20,887	26,454	26,925	31,832

[1] Preliminary.

been responsible for the increase in the yearling program.

These ranchers depend heavily on public range and their cow-calf enterprise has first priority. Yearlings, almost without exception, are grazed on private range. Therefore, if range forage is poor, more cows and calves must be taken off public range and placed on private land, reducing the number of yearlings carried.

During 1960-71, calf prices ranged from a low of $21.80 per hundredweight in 1964 to $38.50 in 1971. Prices received for older animals moved up in a similar pattern and in 1971 livestock from Northern Rocky Mountain ranches sold at prices averaging more than 1½ times the 1960-64 level.

Prices Paid

Prices paid for items and services used in production have moved up year by year, exerting more and more pressure on ranch operators to use production inputs more efficiently. In 1971, the index of prices paid for production items and services reached a level about a third above the 1960-64 base (table 14). Wage rates, one of the most important items, advanced nearly 60 percent, or about 5 percent a year, in 1960-71. Prices paid for machinery and related items advanced nearly 50 percent, and property tax rates increased 65 percent. In 1960 a medium size tractor cost $2,700. In 1971 it cost $4,200. The price of a 4-wheel drive pickup jumped from $2,900 in 1960 to $4,400 in 1971. Prices paid for fencing and building materials increased the least, about 25 and 30 percent, respectively.

Expenses for nonfarm-produced items and wages to hired hands made up approximately 90 percent of total ranch expenses and nearly doubled from 1960 to 1971. Crop yields were good in recent years, so less hay was purchased than in the early 1960's when hay prices were relatively high.

Production Efficiency

Although prices paid for production inputs increased substantially in 1960-71, and total operating expenses rose to record highs, ranchers more than offset these influences by pushing up production per ranch by one-fourth. This reflected consistently better range forage conditions, higher crop yields in recent years, improved management, and larger breeding herds. Since 1962, net physical output per ranch, measured by the index of production per unit of input, ranged from 103 to 116 percent of 1960-64 (table 14). During the last 5 years it averaged nearly a sixth above the early 1960's.

Ranch Capital

Total ranch capital exclusive of estimated value of grazing permits in a typical Northern Rocky Mountain cattle ranch approached $350,000 in 1971. Capital per ranch moved up each year, and in 1971 averaged about three-fifths higher than a decade earlier.

Although the cow herd is practically the same as on Northern Plains cattle ranches, total ranch investment is much lower on Rocky Mountain cattle ranches because of the wide use of public grazing land. In 1971 total value of owned grazing land per ranch was approximately $116,000 on Rocky Mountain cattle ranches and $313,000 on Northern Plains cattle ranches. Estimated value of permits would not make up the difference. Values per acre were not greatly different in the 2 areas. Around two-thirds of total ranch capital is in land on Rocky Mountain cattle ranches and three-fourths on Northern Plains cattle ranches.

Because of heavy winter feeding, Northern Rocky Mountain cattle ranchers carry upwards of 400 tons of hay into the feeding season. There has been a small increase in feed inventory in recent years as the herd size has increased. However, feed inventory as a proportion of total ranch investment as of January 1 had diminished because of the relatively greater value per unit increases in real estate, livestock, and machinery. In fact, hay prices in this area changed little during 1960-71.

Investment in machinery and equipment advanced each year as ranchers paid higher prices to replace equipment, in some instances with larger and more

Table 14.—Northern Rocky Mountain cattle ranches: Production, costs, and prices, 1960-71[1]

Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	1960-64=100											
Net ranch production	93	93	98	111	105	105	108	116	120	124	120	125
Range conditions	96	96	104	103	101	104	93	99	102	103	100	99
Production per unit of input	94	95	99	109	103	103	104	110	113	116	112	115
Operating expenses per unit of production	105	106	106	89	94	99	99	104	96	97	110	112
Total cost per unit of production	102	101	101	95	101	105	109	108	109	112	127	126
Prices received for products sold	96	102	115	101	86	98	112	112	116	132	139	152
Prices paid, including wages to hired labor	99	98	101	101	101	104	105	112	115	120	125	132

[1] Preliminary.

efficient units. Machinery declined slightly in recent years as a proportion of total ranch investment because machinery prices rose less than land prices. In 1971 machinery investment averaged about $20,000 per ranch, less than 6 percent of the total ranch investment. Much of this equipment is old. If it were to be replaced, the cost would be considerably higher and in total value might make up as much as 12-15 percent of total ranch capital.

Investment per Brood Cow

In 1969-71, total ranch investment (land and buildings, machinery and equipment, livestock, and crops in inventory) averaged over $1,050 per cow, nearly a third more than in the early 1960's. The value of the brood cow plus her complement of replacement animals and breeding bulls make up less than $250 of the $1,050 per-cow investment value. This points out again that cattle investment is a small part of total ranch investment and that in considering setting up a cow-calf operation, a person would need about $3 to invest in real estate and related assets for each $1 invested in breeding and replacement stock.

Ownership

Viable Northern Rocky Mountain cow-calf operations are essentially owner-operated, even more so than for Northern Plains cattle ranches. Rocky Mountain ranchers graze livestock on public land about a third of the year, whereas Northern Plains cattle graze private land. The operator must have a grazing permit from the Federal Government for each animal he expects to graze on such land. He must give satisfactory evidence that he owns both land and livestock and that he has sufficient land to maintain his livestock when they are not grazing under permit. Futhermore, many of the operators grew up in the business, some with the family enterprise, and inherited much of their ranch property.

Indebtedness

According to surveys made in 1970 and 1971, nearly all of the ranchers carried real estate debts and operating loans. There was a wide variation in amount of debt per ranch and in rates of interest paid on the loans. Some of the mortgages had long been in effect and were nearly paid off and some were loans on which relatives held the mortgage. Interest rates were usually low on such loans. The most common rate charged on real estate mortgages was about 5.9 percent, slightly higher than a year earlier. The common rate charged on operating loans was 7.4 percent, slightly lower than in the prior year.

Real estate debt averaged around $65,000 per ranch in 1971, slightly higher than a year earlier. Operating loans averaged about $43,000 per ranch, also up slightly. Both types of loans were lower than on Northern Plains cattle ranches. The greatest difference was in real estate loans. This would be expected, as Northern Plains ranchers operate with much more private land and have a much larger investment in land. The ratio of debt to capital assets, however, was higher on Rocky Mountain cattle ranches.

Real estate debt per ranch was more than twice as much on cattle ranches as on Utah-Nevada migratory-sheep ranches, underscoring the effect of public grazing land on ranch operations. The sheep ranchers use considerably more public land. Also, many sheep ranches have been in the family for generations. Loans were smaller on sheep ranches, but to a lesser extent for operating loans than for real estate debts. On a brood animal unit basis (5 ewes per brood cow), Utah-Nevada migratory-sheep ranches are larger than Northwest or Southwest cattle ranches. However, real estate mortgages are less than a third as much on sheep ranches.

Many of the cattle and sheep ranches were financially pressed and carrying maximum debt obligations that might prove disastrous in the face of a sustained drought or economic reverse. However, most ranchers were well within the limits of what most lenders and business managers consider good credit operation.

Operator Returns

Interest paid on real estate and chattel mortgages in 1971 by Northern Rocky Mountain cattle ranchers averaged about $7,000 per ranch (table 15). Accordingly, income available for family living amounted to about $25,000 per ranch, a record high and nearly a fourth above a year earlier. Interest payments were about the same, but net ranch income was higher in 1971. Return on operator's equity capital was about 8.3 percent and return to total ranch capital was 7.7 percent. Both were record high and considerably above returns on ranches of comparable size in other important livestock ranching areas. Return on operator's equity in 1971 was more than double the composite return of 3.37 percent on common stocks.

Table 15.—Northern Rocky Mountain ranches: Returns to resources per ranch, 1971

Item	Unit	1971
Net ranch income	Dollar	31,832
Interest paid on mortgages[1]	do.	7,017
Income available for family living	do.	24,815
Charge for operator's services[2]	do.	5,300
Return to operator's equity capital	do.	19,515
Total ranch capital	do.	344,060
Operator's equity capital	do.	236,060
Return on total capital	Percent	7.7
Return on operator's equity capital	do.	8.3

[1] Real estate mortgage of $65,000 at 5.9 percent and operating loans of $43,000 at 7.4 percent. [2] Annual wage to a full-time hired hand x 1.25 plus perquisites.

Return to capital on most livestock ranches has varied considerably and in many years has not been very large. During the last 12 years (1960-71), returns to ranch investment on Utah-Nevada migratory-sheep ranches

ranged from about zero to around 7.5 percent, averaging 4.3 percent. On Northern Plains cattle ranches returns ranged from 2.0 to 5.7 percent of ranch investment, averaging 3.5 percent. On Northern Rocky Mountain cattle ranches, returns varied from 2.5 to 7.7 percent, with an average of 5.0 percent.

From 1965-71, years for which comparable data were available on Southwest cattle ranches, returns to investment averaged 1-2 percent. However, during much of this time Southwest cattle ranchers were plagued with droughts. In addition, the carrying capacity of their ranges is low and land values are relatively high partly due to capitalization of mineral rights connected with the land. Considering the relatively high real estate values, returns on capital are fairly rewarding to Northwest cattle ranchers.

Capital appreciation is an important element of remuneration that has kept many farmers and ranchers in business. During 1960-71, net asset appreciation on the typical Northern Rocky Mountain cattle ranch amounted to nearly $118,000, or approximately $9,800 per year. This is somewhat below asset appreciation on Northern Plains cattle ranches, but well above that on Utah-Nevada migratory-sheep ranches. In estimating net capital appreciation, each addition to ranch assets was charged against the closing-year inventory at the value or price paid for the respective asset in the year it was added. Likewise, each item sold was credited to the inventory in the year sold. Thus, adjustments were made for physical change in assets.

INVESTMENT PER ANIMAL UNIT

Total capital per ranch now exceeds a half-million dollars for a cow-calf unit with around 300 brood cows. Investment per ranch has moved up as buyers have bid up the price of land, and as costs of machinery and equipment and related items have advanced with the general price level. Consumers have demanded more and more red meat, particularly beef. With the need for more feeder livestock, the prices of resources to produce these animals have been bid up.

From 1960 to 1971, total investment per ranch increased 66 percent on Northern Plains cattle ranches, 60 percent on Northern Rocky Mountain cattle ranches, and 28 percent on Utah-Nevada migratory-sheep ranches. On Southwest cattle ranches, capital assets advanced 47 percent from 1965 (earliest estimates available) to 1971. This is an average annual increase ranging from around 2.3 percent on sheep ranches to 6.7 percent on Southwest cattle ranches. Estimated value of permits to graze public land is excluded from these estimates.

Herd size changed little from year to year but there was an upward trend, particularly in some areas and on some types of ranches, as economic conditions improved and range forage conditions allowed.

For example, wool producers encountered low wool prices during the last 2 decades. In addition, migratory-sheep ranchers operate their sheep under grazing permits most of the year. Also, because the sheep are herder-controlled throughout the year, there are economic and management restraints on units above or below optimum herd size. Sheep herd size has changed little.

Southwest cattle ranchers encountered severe droughts the last few years, and despite encouraging economic conditons, herd size eased slightly downward. On the other hand, Northern Rocky Mountain cattle ranchers had a sustained period of better than average range conditions plus relatively favorable feeder-calf prices. They increased herd size substantially.

Investment per animal unit provides a more suitable basis for measuring changes in capital invested and for comparing capital requirements in ranch operations (table 16). Several worthwhile points are brought out in a study of these estimates.

(1) The relatively low total investment and low uptrend, particularly in land investment, per animal unit on sheep ranches. Chiefly responsible for the relatively lower ranch investment is the institutional factor of wide use of public land and thus the need for less private land. Sheep on these units graze upwards of two-thirds of the year on public land. The cause of the slower increase in land values no doubt is low wool prices and less favorable economic future for sheep and wool relative to beef. Greater use of public land is the chief reason for lower land investment, and thus lower total investment per unit on Rocky Mountain cattle ranches than on Southwest and Northern Plains cattle ranches.

In 1971, real estate investment per dollar of livestock investment averaged around $1.75 on sheep ranches, the greatest user of public land; $2.50 on Rocky Mountain cattle ranches, the next biggest user of public land; $3.50 on Northern Plains cattle ranches where practically no public land is used but light to medium winter feeding is done; and $5.25 on Southwest cattle ranches where livestock graze year-around, mostly on private land of relatively low carrying capacity where normally only small amounts of feed supplements are fed. The ratio of real estate investment per dollar of livestock investment was even higher in 1965 than in 1971.

Offsetting some of the lower real estate investment was higher feed and grazing costs. In 1970-71, feed and grazing costs per ranch averaged nearly $5,900 on sheep ranches, $3,800 on Rocky Mountain cattle ranches, $1,900 on

Table 16.—Investment per animal unit, selected Western livestock ranches, 1960, 1965, and 1971

Item	Cattle ranches									Migratory-sheep ranches[4]		
	Northern Plains[1]			Rocky Mountain[2]			Southwest[3]					
	1960	1965	1971[5]	1960	1965	1971[5]	1960	1965	1971[5]	1960	1965	1971[5]
	Animal units[6]											
Number	403	430	449	344	361	408	NA	348	342	470	484	491
	Dollars											
Investment in:[7]												
Land and buildings	484	581	752	400	526	552	NA	908	1,304	247	255	276
Livestock	162	133	216	161	141	217	NA	124	250	111	121	159
Machinery and equipment	35	37	47	40	43	50	NA	30	35	23	24	32
Crops	7	10	12	24	30	24	NA	0	0	2	2	3
Total	688	761	1,027	625	740	843	NA	1,062	1,589	383	402	470

[1] Consists of 15 counties in Montana, 8 counties in Wyoming, and 9 counties in South Dakota. [2] Consists of 12 counties in Montana and 7 counties in Idaho. [3] Consists of 20 counties in Texas, 11 counties in New Mexico, and 3 counties in Arizona. [4] Consists of 19 counties in western Utah and 6 counties in eastern Nevada. [5] Preliminary. [6] An animal unit consists of 1.0 cow or heifer 2 years old and over, 1.33 steers or heifers 1 year old, 0.83 bull of breeding age, and 5.0 head of stock sheep. [7] Excluding value of grazing permits.

Northern Plains cattle ranches, and $10,000 on drought-stricken Southwest cattle ranches. Operators of Southwest cattle ranches rent considerable private grazing.

(2) A further observation is the rapid increase in land investment per animal unit on cattle ranches relative to sheep ranches. From 1960 to 1971, land investment per animal unit increased 55 percent on Northern Plains cattle ranches, 38 percent on Rocky Mountain cattle ranches, and 12 percent on migratory-sheep ranches. This might be indicative of the brighter outlook for beef relative to wool and lamb, particularly wool. No doubt, part of the reason for the lesser increase in land values on sheep ranches is the wider use people are making of public lands and related natural resources. Multiple use of public lands means a loss in sheep trail lanes and grazing areas and an increase in sheep and lamb predators. Herder and related operating problems have loomed larger to sheepmen.

While machinery and equipment investment is not a major item on livestock ranches, it is becoming more of a problem on sheep ranches. Also, sheep ranchers are incurring more contract costs such as trucking sheep and lambs to and from range areas.

(3) A ranching operation entails a particularly high investment in assets other than livestock. In 1971, an investment of $3.00-$5.50 was required in land, fences and corrals, stock water wells, ponds and improvements, and machinery and equipment for each dollar invested in cattle. Sheep required nearly $3.00.

If value of grazing permits is included on ranches where applicable, total capital per ranch would be increased around $25,000 on Rocky Mountain cattle ranches and $80,000 on migratory-sheep ranches. This would bring total ranch capital to approximately $370,000 on Northern Rocky Mountain cattle ranches and $310,000 on Utah-Nevada migratory-sheep ranches. Even then, total ranch investment for these ranches would not equal that for cattle ranches in the Northern Plains or the Southwest. However, the value of grazing permits appears to be declining, and theoretically should approach zero as fee rates on public lands are escalated to eventually reach a level termed "fair market value," competitive with private grazing lands.

Until the late 1960's, there was an active market for grazing permits. The permit value is related to the productivity of the range and its accessibility. In 1968-69 most permit values ranged from $15 to $20 per ewe or $75 to $100 per cow. The usual ratio is 5 ewes per cow. In late 1971, a few BLM sheep permits were offered for sale at around $8 per ewe, but there was no active buying. Of course, as grazing fees escalate, operating costs will increase and theoretically values per acre of grazing land will be affected.

COST OF PRODUCING FEEDER STOCK

Total cost of producing feeder stock in 1971 amounted to $34.04 per hundredweight on Northern Plains cattle ranches and $30.39 on Northern Rocky Mountain cattle ranches (table 17). These costs are less than 2 percent lower than the records a year earlier, but around a fourth higher than in 1960-64. Cost of producing feeder stock moved up a little more than 2 percent a year since 1960, but average prices received for feeders rose by nearly 5 percent per year.

Table 17.—Cost per 100 pounds of feeder stock produced, Northwest cattle ranches, 1960-64, 1969-71, and 1971

Item	1960-64		1969-71		1971	
	Northern Plains	Rocky Mountain	Northern Plains	Rocky Mountain	Northern Plains	Rocky Mountain
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Investment:						
Total	201	163	270	200	267	203
Real estate	142	108	201	133	196	133
Livestock	47	40	54	49	56	52
Machinery and crops	12	15	15	18	15	18
Cost:						
Total operating	13.33	12.90	14.18	13.65	14.11	14.27
Feed and grazing	2.53	2.91	1.13	1.91	.93	2.09
Livestock replacements	1.05	1.07	1.00	1.00	1.02	1.04
Machinery	3.13	3.12	3.74	3.57	3.80	3.70
Buildings	1.01	.43	1.10	.44	1.08	.44
Hired labor	2.88	2.84	3.68	3.51	3.72	3.68
Property taxes	1.59	1.17	2.12	1.48	2.16	1.52
Crop and general ranch	1.14	1.36	1.41	1.74	1.40	1.80
Operator labor[1]	2.40	2.45	3.06	3.01	3.07	3.12
Capital[2]	10.96	9.06	16.74	12.87	16.86	13.00
Prices received:						
Calves	25.94	25.58	36.00	35.60	38.50	38.50
Steers and heifers	22.42	21.90	29.33	29.37	31.70	31.80
Cows	13.86	13.90	20.90	21.37	22.30	22.80
Weighted average	21.33	21.31	29.45	30.10	31.54	32.42
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*
Net production	1,460	1,429	1,654	1,660	1,726	1,698

[1] Wage charged for operator labor and management is approximately one-fourth above the rate paid for regular hired hands. In addition, the family receives farm-produced perquisites including dwelling. [2] Real estate investment is charged at interest rates on real estate loans outstanding. Investment in livestock, machinery and equipment, and feed in inventory is charged at average interest rates on operating loans.

Most of the increase in production costs was capital charge. Land values and livestock prices have increased much more since 1960 than wage rates and prices of operating inputs such as machinery replacements and operating costs, feed purchases, building and fencing materials, and taxes. From 1960 to 1971, operating costs per 100 pounds of feeder stock produced went up about 7 percent on Northern Plains cattle ranches and 10 percent on Rocky Mountain cattle ranches. Capital charges increased 63 percent and 51 percent respectively.

Capital charges make up nearly half of total production costs on Northern Plains ranches and around two-fifths on Rocky Mountain ranches. Charges for operator's labor and management make up around 10 percent of total costs. In certain respects, these charges might be considered returns to operators who own the land.

Excluding capital charge, labor cost is the largest item. Operator and hired labor together make up around a fifth of total cost. Wage rates increased nearly a third from 1960 to 1971.

The relative importance of real estate investment in cattle ranching is evident again. Real estate accounts for about three-fourths of total investment on Northern Plains cattle ranches and two-thirds on Rocky Mountain ranches. During 1969-71, real estate investment per 100 pounds of feeder stock produced averaged around $130 on Northern Rocky Mountain cattle ranches and $200 on Northern Plains cattle ranches.